FY2007 ***Annual Report*** of the 319 Nonpoint Source Grant Program

Submitted to USEPA, Region IV - January 9, 2008

Tennessee Department of Agriculture
Water Resources Program

Restoring…

Protecting…

Tennessee's Water Resources

Introduction

The Tennessee Department of Agriculture (TDA) manages the 319 Nonpoint Source Program (NPS) with approval and oversight of the US Environmental Protection Agency. This report is required under the provisions of the grant award to TDA.

Today, nonpoint source (NPS) pollution is the nation's largest source of water quality problems. It's the main reason that approximately 40 percent of our surveyed rivers, lakes, and estuaries are not clean enough to meet basic uses such as fishing or swimming. NPS pollution occurs when water runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, and coastal waters or introduces them into ground water. NPS pollution is widespread because it can occur any time activities disturb the land or water.

To address this diffuse type of pollution, congress established the Nonpoint Source Program, funded by the USEPA through Section 319 of the Clean Water Act. The Tennessee Department of Agriculture administers the Nonpoint Source Program in Tennessee on behalf of USEPA. This program provides funds to states, territories and Indian tribes for installing Best Management Practices (BMPs) to stop NPS pollution; providing training, education, and demonstrations; and monitoring water quality.

The TDA-NPS Program is non-regulatory and promotes voluntary, incentive-based solutions. The program is a cost-share program, meaning that it pays for 60% of the cost of a project. It is up to the grantee to come up with the remaining 40%, usually in cash and "in-kind" services. It primarily funds three types of projects:

1. **BMP Implementation Projects** improve an impaired waterbody, or prevent a non-impaired water from becoming placed on the 303(d) List. Projects of this type receive highest priority for funding. All projects involving BMPs must be based on an approved "Watershed Based Plan".
2. **Monitoring Projects.** Up to 20% of the available grant funds assist water quality monitoring efforts in Tennessee streams. Currently all of our monitoring money each year is awarded to the Tennessee Department of Environment and Conservation to support their ongoing, statewide water quality monitoring efforts.
3. **Educational Projects** funded through TDA-NPS raise awareness of practical steps that can be taken to eliminate NPS pollution. Projects funded can either have a statewide, general public aim or can focus in on local, targeted audiences with specific messages.

Eligible applicants include non-profit organizations, local governments, state agencies, soil conservation districts, and universities

Programs Highlights from FY2007

Significant Grant Milestones in Fiscal Year 2007:

- The FY2000 grant expired on September 30, 2006; the Closeout Report was submitted and the grant was officially closed by EPA, Region IV on March 19, 2007.
- The FY2001 grant expired on December 31, 2006; the Closeout Report was submitted and the grant was officially closed by EPA, Region IV on June 24, 2007.
- The FY2007 grant was awarded on July 11, 2007.

It is significant that two grants were closed out this year because it now puts the Tennessee NPS program in position to receive one grant each year and close out one grant each year. Due to Grant extensions given over the years, there was a period of several years where there were multiple grants expiring each fiscal year. Receiving one grant and closing out one grant each year will greatly simplify the process of managing the grants.

Another achievement to note is that all remaining, unobligated funds from the FY2005 and FY2006 grants were put under contract this year. It is also important to point out that all of the FY2007 grant funds were obligated and will soon be under contract as well. Beginning with the FY2005 grant, as outlined in EPA guidance, an approved "Watershed Based Plan" was required for all projects involving implementation of Best Management Practices (BMPs). While perhaps a worthwhile endeavor, the fact that there were no preexisting Watershed Based Plans meant that there was a dearth of projects suitable for funding in FY2005 and FY2006. Therefore, the NPS program was unable to allocate all FY2005 and FY2006 grant funds in the normal timeframe. However, by the time the FY2007 funding cycle came around, enough Watershed Based Plans had been written and approved that all remaining FY2005 and FY2006 funds were obligated, as well as all FY2007 funds. Now that NPS program partners are aware of the Watershed Based Plan requirement and have had several years to ramp that effort up, the requirement for Watershed Based Plans will not hinder the program's ability to put all of a particular grant year's funds under contract in a timely manner again.

The Tennessee NPS program hosted or attended several important meetings/conferences in FY2007 related to nonpoint source issues. On December 14, 2006 the NPS program hosted a meeting on "Working in Tennessee Watersheds" at the request of Vivian Doyle from EPA, Region IV. John McClurkan attended the "Nutrients – EPA, State, and Agricultural Agency Perspectives" conference held May 23-24, 2007 at Calloway Gardens. Carole Swann attended the regional GRTS coordinators meeting in Atlanta, June 26-28, 2007. On July 12 and 13, Yolanda Brown and Sharon Brown from EPA, Region IV came for a program review and went on a tour of project sites in middle Tennessee. On September 13, 2007 Sharon Brown returned for a tour of agricultural BMPs installed as part of projects in west Tennessee. Sam Marshall and John

McClurkan also participated in the meetings and watershed tours of the Beaver Creek and Little River watersheds on September 26 and 27, 2007. These were attended by a large group of NPS program partners and most notably by several upper-level administrators from USEPA headquarters office in Washington, D.C.

As is the case almost every year, several projects that have received funds from the NPS program have won awards in the past year. The following two 319 projects received *Governor's Environmental Stewardship Awards* from the Tennessee Department of Environment and Conservation in 2007.

Green Schools Award for Higher Education:

Middle Tennessee State University (MTSU) WaterWorks! (Rutherford County)

WaterWorks! is a public education and outreach program of the MTSU Center for Environmental Education designed to promote clean water in Tennessee through a number of initiatives, including a series of public service announcements, advocating water quality through responsible action and print media focusing on homeowner, builder/developer, and agriculture practices that affect water quality. WaterWorks! provides educational materials and information to storm water municipalities, watershed organizations and other citizen groups and the general public to raise awareness and reinforce the message of individual responsibility for water quality in Tennessee.

(l-r) Deputy Governor Stuart Brunson; Paula Larson, TDEC Used Oil coordinator; Karen Hargrove, MTSU Center for Environmental Education coordinator; Carole Swann, Department of Agriculture environmental specialist; Deputy Commissioner Paul Sloan

Excellence in Parks & Recreation:

City of Chattanooga Renaissance Park (Hamilton County)

Renaissance Park is a conservation and environmentally focused 23-acre brown field project that was created as a part of Chattanooga's 21st Century Waterfront Plan. The site of enameling and stove manufacturing plants on the North Shore of the Tennessee River for over 70 years, Renaissance Park successfully demonstrates how a once-polluted area can be restored to an ecologically-sound river habitat and a natural park setting within an urban and tourism driven landscape. The city restored an urban stream ecology, enhanced river eco-systems, promoted the return of native plants and animals, raised awareness of the area's historical significance, and maintained the balance between urban renewal and the conservation of natural resources.

(l-r) Deputy Governor Stuart Brunson; Lawrence Zehnder; City of Chattanooga Parks administrator; Jeff Pfitzer, River City Company project coordinator; Greta Hayes; City of Chattanooga Parks assistant director; Kevin Brady; City of Chattanooga Parks director; Deputy Commissioner Paul Sloan

In addition to the two projects above, the project below was funded through our state Agricultural Resources Conservation Fund and was also selected for a *Governor's Environmental Stewardship Award*. Each year the entire Agricultural Resources Conservation Fund is counted as match in the NPS program. This project was also featured in the Tennessee Department of Agriculture's Annual report.

Excellence in Agriculture and Forestry Award:

Raymond Cooper Farm Grazing Technology for Water Quality (Cannon County)

Raymond Cooper Farm Grazing Technology for water quality has installed fences, several pipelines and water systems at strategic locations throughout the farm to help protect and manage the grass base and implements a rotational grazing system. The system allows the farm to reduce its output cost significantly by using less fertilizer and harvesting less hay. Raymond Cooper has also excluded his cattle from a stream and ponds on the property to preserve water quality and habitat for the Barrens Topminnow, which is considered a threatened species by the State of Tennessee and is only located in Cannon, Coffee and Warren Counties.

(l-r) Deputy Governor Stuart Brunson; Raymond Cooper; Pamela Hoskins; USDA Natural Resources Conservation Service soil conservationist; Deputy Commissioner Paul Sloan

We are also proud of the fact that the Tennessee Department of Agriculture received a *Governor's Environmental Stewardship Award* this year for work done on our campus, the Ellington Agricultural Center. While no 319 grant money was spent on this project, considerable NPS program staff time was dedicated to designing and implementing many of the project's objectives.

Excellence in Aquatic Resource Preservation Award:

Tennessee Department of Agriculture Sevenmile Creek – Ellington Restoration Project (Davidson County)

(l-r) Deputy Governor Stuart Brunson; Dodd Galbreath, URS Corporation senior project manager; Mike Berkley; GroWild, Inc.; James Baker; Department of General Services facility administrator; Andy Sudbrock, Nashville Natives, LLC; Larry Maxwell, Department of Agriculture assistant commissioner; Deputy Commissioner Paul Sloan

The Sevenmile Creek Restoration project encompasses the installation of seven storm water retention structures, which capture over 90 percent of all the rainfall and runoff that exists on the Ellington campus, as well as the grading and planting of native shrubs and flowers on approximately 1,000 linear feet of vertical and eroding stream banks. Forty acres of the floodplain on campus were placed in a perpetual conservation easement and six parking lot filtration basins were designed and constructed with porous concrete travel lanes. Rain barrels were installed, 25.5 acres of previously mowed lawns or pastures have been converted to native meadows or native storm water structures and 7,600 feet of primitive trails were created. This project represents an effort to retrofit a state-owned campus with the latest in low impact development practices, bioretention technology, aquatic habitat restoration and other progressive techniques to restore a 303(d) listed impaired stream to a higher state of water quality.

In a continuing effort to draw national attention to the accomplishments of 319 funds, the Tennessee NPS program has continued to generate ***Success Stories***. This year **ten** new *Success Stories* were published on USEPA's website. Each of these stories has been included in ***Appendix A*** to this report. All of these stream segments were removed from the state's 303(d) list between 2002 and 2004 because of significant water quality improvement. Definite "cause and effect" relationships are hard to prove, but substantial BMP installation and other conservation measures were established within all of these watersheds. While the NPS program cannot take all the credit for delisting these streams, 319 funds did play a significant role in enabling at lease a portion of the BMP work to be done in each of these watersheds.

TDA-NPS Program Vision Statement

TDA-NPS Program will be the most effective provider of 319 funding in the nation as we seek to restore and protect Tennessee's water resources from nonpoint sources of pollution.

TDA-NPS Program Mission Statement

The mission of the TDA-NPS Program is to:
Measurably reduce nonpoint source pollution in Tennessee,
Measurably improve Tennessee's water quality,
Continuously strengthen and expand partnerships, and
Increase the water resources stewardship of Tennessee's citizens.

TDA-NPS Program Long Term Goals

Long Term Goal 1.
Hold regularly scheduled meetings with stakeholders, to create new partnerships, strengthen existing partnerships and to foster greater trust, commitment and accountability.

Long Term Goal 2.
Fully implement all developed TMDLs for nonpoint sources in compliance with existing regulations, policies, or agreements by 2015.

Long Term Goal 3.

Restore all waters impaired by nonpoint sources that are listed on the 1998 303(d) List to the condition of fully supporting their designated uses by 2015, in cooperation with local, state and federal partners.

Long Term Goal 4.
Beginning in 2006, through regulatory and non-regulatory means, prevent previously unlisted waters from being included on the 303(d) List because of nonpoint source impairments.

Long Term Goal 5.
Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution.

Long Term Goal 6.
Through the process of continuous improvement, routinely assess all programmatic functions of the TDA-NPS Program in order to maximize efficiency, decrease the bureaucratic burden and increase the numbers of participants in the program.

Long Term Goal 7.
Use the maximum allowable percentage of funding annually to assist partners with water quality monitoring and assessment, for the duration of the 319 program.

Project Summaries for FY2007

(In alphabetical order, by grantee)

PROJECT NAME: Bullrun Creek Restoration Initiative
GRANTEE: Anderson County Soil Conservation District
GRANT YEAR: FY2006

We have been slow getting started due mainly to an excessive turn over in staff. We are finally up and running with several projects completed and many in the planning and construction stages. We are in the process of developing a spreadsheet and timeline to better track our actions and accomplishments and to insure we send our required reports in timely.

Our hiring committee chose Doug Harter out of many qualified candidates to be the Bullrun Creek Technician. He started employment March 30, 2007 and is handling both Ag BMP's and Septic Systems. We have provided costshare for Ag Bmp's to a total of four landowners in Knox, Union, and Anderson County. A total of 1000 feet of livestock exclusion fencing and 2,655 feet of cross fencing for rotational grazing have been installed. We have also completed 56 acres of pasture renovation, 2 acres of critically eroding area treatments, and two stream crossings.

The first Bullrun Creek Newsletter is nearing completion and should be ready to mail out in the next week or two. We are in the planning stages for the three required BMP/NPS workshops which we hope to have completed by 8/31/2008. Flow data has been collected from numerous sites throughout the watershed and pebble counts have been conducted in at least 6 sites within the watershed.

PROJECT NAME: Project WET - Tennessee Phase II – The Next Step
GRANTEE: Austin Peay State University, The Center of Excellence for Field Biology
GRANT YEAR: FY2004

Project WET Water Education for Teachers

Website: http://www.apsu.edu/field_biology/

During the previous year, a great deal of progress was made to make Project WET a more widely known, respected, and supported program. Dedicated facilitators, supportive organizations, and volunteers made it possible to reach large numbers of teachers and students this year. Project WET provided 35 six-hour workshops to Tennessee educators across the state. Over 550 teachers were trained to take water education into their classrooms. Each participant was provided with the *Project WET Curriculum & Activity Guide* and other materials to ensure application in the classroom. Four new facilitators were trained. Eight universities in Tennessee now provide Project WET training to students pursuing their teaching degree.

Teachers at the Tennessee Environmental Education Association Conference making rainstick instruments to share with their classes.

Three "Make A Splash" water festivals took place this year, involving over 580 students and 55 volunteers in outdoor education events. At the festivals, students moved in groups through multiple water-related activity stations. Additional funding for these festivals was provided by Project WET International Foundation and Nestle Waters North America. Project WET Tennessee also provided an activity station at an Earth Day event and an Environmental Awareness Day event. APSU undergraduate students helped reach over 1,400 students and their teachers at these events

Fourth graders at a Make A Splash water festival making a model of a watershed.

PROJECT NAME: Dry Creek Watershed Project
GRANTEE: Chickasaw-Shiloh RC&D Council
GRANT YEAR: FY2004

Five landowners completed practices on their farms this past year benefiting 760 acres. Two new contracts were developed this year on 100 acres. The geomorphic assessment was completed and we are still waiting for a meeting with geomorphologist to discuss the developed assessment. Since the Nature Conservancy has lost personnel, we have lost some of the continuity with getting the review of the assessment. This will be overcome.

There is renewed interest in the area due to a revitalization of the Hatchie River Alliance. A meeting will be held in December, 2007 or January 2008 to decide on the possibility of in-stream structures to assist with stabilizing sediment loads within stream.

Types of head cuts that are being treated.

Completed grade stabilization structure

Alternative watering system to remove cattle from stream

PROJECT NAME: Outdoor Chattanooga Center Green Roof Education Project
GRANTEE: City of Chattanooga
GRANT YEAR: FY2006

The green roof project was originally part of a larger concept that included two accompanying components. The first component was the design and construction of a 23 acre urban park, to be named Renaissance Park. This environmentally friendly park contains numerous environmental, recreational and historical attributes, as well as two ecologically significant features. The ecological features include the wetlands which were engineered to collect polluted water from urban runoff, naturally filter this water using native plants and other natural systems, and release improved quality water back into the ecological system that eventually flows down stream into the Tennessee River. (Figure 1) The second component of this project is the construction of the Outdoor Chattanooga Center. This facility is to serve as the gateway and educational center to Renaissance Park where a variety of stakeholders would be provided urban stormwater education focusing on the various methods of dealing with the challenges of urban ecology all within the setting of a world-class educational environment. This facility originally was to also serve as the administrative office for Outdoor Chattanooga, a division of the City of Chattanooga's Parks and Recreation Department. It was determined however, after the design was completed and available funds were reviewed, that construction of a facility of this magnitude was cost prohibitive. Consequently a concept was chosen to take a more passive approach to environmental education. Design of the facility was scaled down to become an open-air educational and recreational pavilion that would provide a unique gathering space, as well as an educational venue to explore park features and themes. This green and living roof was constructed as originally proposed in conjunction with this facility. Construction of the park, pavilion and green roof are now complete.

This project is located within the Lower Tennessee River Basin watershed. The location of this project is along the North Market Street Branch, which is listed on the 2004 303(d) list as impaired due to E. Coli. While this project will not address the removal of this nonpoint source, it will minimize the introduction of additional nonpoint sources into this waterbody due to the Outdoor Center development. The North Market Street Branch is listed on the 303(d) list as segment number TN06020001 001T-0200; Latitude: 85 degrees, 18 minutes, 36.72 seconds W; Longitude: 35 degrees, 3 minutes, 40.52 seconds N.

The green roof was completed on August 13, 2007. Construction costs were initially projected at $179,415.00. The project was actually completed for $100,309.00. The match for the actual cost will be $47,284.00 which is sufficient to cover the required 60/40 funding requirements.

The pavilion was completed on August 13th, 2007. The green roof has been seeded but there is no growth as of yet.

The original concept for the building had to be adjusted due to the resources available for construction. The new image for the building combined with a more passive approach to environmental education that was thought to be the most effective use of available assets. The city still anticipates engaging the city's water quality division and possibly other environmental groups in events at the park using this new pavilion. The Tennessee Valley Authority (TVA) continues to be instrumental to the success of this project. TVA designed the wetland filtration system that is one of the ecological features of the park. Signage will be place in a prominent position near the wetlands to narrate how this system works and explain why it is important to the environment. Signs at the pavilion will explain how the green roof helps protect the environment.

When assessing the success of this project as measured by the original scope and budget, it is important to understand that this project was originally submitted as a $300,000.00 project in which the Department of Agriculture would fund 60% in the amount of $180,000.00. The project was accepted but the amount awarded $53,025.00 was significantly less than requested. The work plan was submitted under the assumption that $180,000.00 would be available to complete the green roof. The design of the facility, the roof, as well as the educational services to be provided, were adjusted so the project could be completed with funds that were available. The product is a well-designed recreational facility, covered by a living green roof, located in a unique ecological urban park designed to promote environmental education.

PROJECT NAME: Madd Branch Phase II – NPS Management Measures Implementation
GRANTEE: City of Kingsport
GRANT YEAR: FY2005

Website: http://ci.kingsport.tn.us/

During the period from October 1, 2006 through September 30, 2007 several activities took place resulting in the close out of Phase I-Mad Branch Watershed Plan Development and transitioning to the submittal and approval of Phase II-Mad Branch NPS Management Measures Implementation. On November 17, 2006 the Madd Branch

Steering Committee met to revise the Phase II NPS Management Measures Implementation proposal to meet its expectations and budget. The City of Kingsport Board of Mayor and Aldermen then passed a Resolution on November 21, 2006 applying for a 319 Watershed Implementation Grant to provide matching funds to implement Phase II. The plan and grant application was then submitted to the State on November 30, 2006 for consideration. The Final Closeout was submitted for Phase I on January 5, 2007.

The Phase II Contract was submitted to the City in July, 2007 for signatory purposes. The Mayor of Kingsport signed the Contract on August 1, 2007, which was then returned to the State for the remaining signatures. The Contract became effective on August 16, 2007 but the official, signed documentation was dated September 28, 2007 and received by the City on October 1, 2007. The first meeting of the Stakeholder Steering Committee has been held and will be documented on the quarterly report ending December 31, 2007. Below are several pictures depicting areas of concern to be addressed during Phase II.

Typical scenes from the Madd Branch watershed.

PROJECT NAME: Lower Clinch River Watershed Protection Plan
GRANTEE: Clinch-Powell Resource Conservation & Development (RC&D) Council
GRANT YEAR: FY2005

This document was prepared by as a guideline to restore the biological integrity of the middle portion of the Clinch River Watershed, located in Hancock County, Tennessee. This plan identifies those stressors, and sources of stress which have degraded the Clinch River and its tributaries to the point that most do not currently meet their intended aquatic and human uses. The information attained through this study has resulted in goals and objectives designed to return the Middle Clinch River and tributaries, including two 2006 303(d) listed streams, back to the classification of fully supporting their designated uses. This document was created following the 2006 Tennessee Department of Agriculture –

Greasy Rock Creek has a long history of pathogen loading into the Clinch River. Since this stream is the main drainage for the county seat of Sneedville, the pollution causes can be attributed to agriculture, development and industry.

Non Point Source program guidelines for a Watershed-Based Plan and includes each of its nine key components.

We learned that there is a lot of factors that contribute to the degradation of a watershed and that each watershed and tributary are different. Many factors arose as pollutant sources including industrial, agricultural, forestry, municipalities, private homeowners, highway departments and various other undefined sources. Individually they are not hard to correct but combined they can become overwhelming from both a labor and financial standpoint.

Equally problematic is the documentation of success. There are so many parameters to monitor and the parameters are not source specific so it becomes hard to attribute water quality improvements to your remediation efforts. This will be the constant challenge of the restoration project but we feel that any progress made will be an improvement of the overall goal of water quality improvement and aquatic biodiversity protection.

Another issue to deal with will be improper logging techniques. We are very confident that many of the environmental needs in the target watersheds can be corrected if we only had knowledge of where they are and which landowners will cooperate. This knowledge has been one of the early benefits of this watershed protection plan.

We have defined the Middle Clinch River watershed priority area, for the purposes of this watershed restoration plan, as the Tennessee portion of the Upper Clinch River watershed, including all portions of the USGS 12 digit HUCs: Upper Clinch River Watershed including all or portions of the USGS 12 digit HUCs: 060102050808 - Clinch River, 060102051002 - Clinch River, and 06010205085 - Panther Creek. This priority area was selected based on personal knowledge of and data

that identify the locations of 5 significant mussel assemblages in the MCR priority area. The priority area was refined to include areas of greatest need and potential benefits to biological and water quality attributes, as identified by USGS, USEPA, TDEC, USFWS, TDEC Division of Natural Areas and NRCS. The Middle Clinch River watershed includes the mainstem Clinch River, tributaries to the river and feeder streams to both the river and tributaries. The boundaries of this plan are the Clinch River from mile 172 (Swan Island) to mile 183 (Brooks Island) and tributaries. The boundaries of this plan are the Clinch River from mile 172 (Swan Island) to mile 183 (Brooks Island) and include the subwatersheds of Brier Creek, Chestnut Ridge Creek, Duck Creek, Fall Branch, Farmers Branch, Garland Branch, Garland Hollow Creek, Greasy Rock Creek, Lamb Hollow Creek, Panther Creek, Rhea Branch, Swan Creek, and Yellow Branch. Two of the river tributaries, Greasy Rock Creek and East Fork Panther Creek, are listed as impaired in the Year 2006 303(d) list.

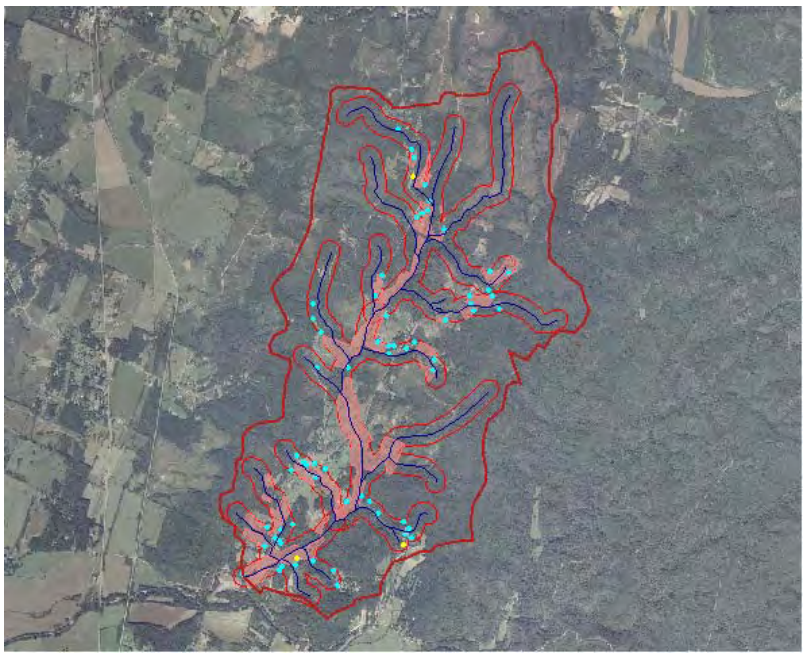
PROJECT NAME: Mill and Ball Play Creeks Restoration Plan
GRANTEE: Conasauga River Alliance
GRANT YEAR: FY2006

Two informational meetings were held in November 2006, with Polk County SWCD Board and Bradley County USDA to describe project and data needs in support of watershed plan development. A "kick-off" meeting is planned for fall 2007, with Cleveland State College to enlist volunteers for field verification and GIS data file updating.

Data acquisition of existing photogrammetric and digital coverages for Ball Play and Mill Creeks has been time consuming. Differences in existing aerial and digital coverages for the two watersheds are due to differences in data sources for Polk and Bradley counties respectively. This resulted in more time required to complete the data acquisition task thus delaying the start of follow-up field verification tasks with volunteers. Stakeholder meetings and field verification tasks will now proceed (fall 2007). This will also help regain in-kind match budget targets for the project.

The figures below are examples of the type of background work we have been doing on causes and sources and locations of pollution. The two summarize potential fecal coliform and sediment sources within a 100-foot buffer of streams in the Ball Play and Mill Creek watersheds respectively.

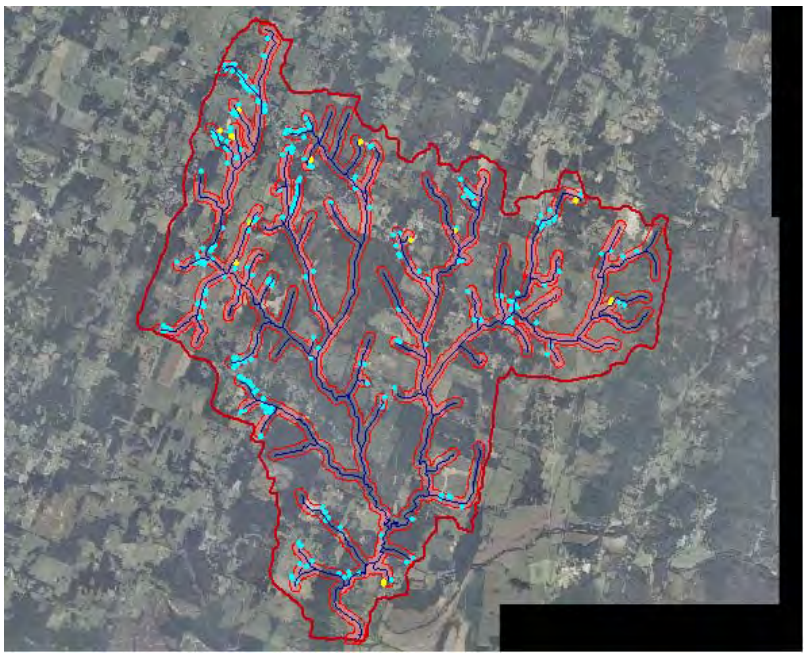
Figure 1: Ball Play Creek Watershed Summary
100-foot Buffer Analyses - Potential Coliform Sources and Riparian Losses



Legend:

Blue line = streams
Red line = 100-foot buffer from blue-line stream
Blue box = houses/septic systems
Yellow box = CAFO (confined animal feeding operations, typically poultry)
Red shaded areas = stream buffers through agricultural lands with little or no vegetative canopy cover

Figure 2: Mill Creek Watershed Summary
100-foot Buffer Analyses - Potential Coliform Sources and Riparian Losses



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PROJECT NAME: Building Outside the Box (BOB) Monitoring
GRANTEE: Cumberland River Compact
GRANT YEAR: FY2004

The Building Outside the Box (BOB) Monitoring Program, a project of the Cumberland River Compact, has the goal of monitoring stormwater runoff from the BOB sustainable building demonstration site in the Mill Creek watershed. It will compare the volume and quality of rainfall runoff from a conventional building site and a project site with low impact infiltration features. The BOB model site will use model erosion control practices during construction and put in place low impact development features for improved post construction stormwater management. This monitoring will document the costs and benefits of low impact development practices.

Educational Activities

In 2007 the following progress has been made on the monitoring project:

- The Antioch BOB site, with its high performance demonstration house at 2105 Three Stone Court and better site design work, continues to be a focal point for education about the benefits of sustainable building practices.
  - The BOB project site and house information has been included in over 10 educational presentations to various audiences
  - The site was visited in November 2006 by a delegation from the EPA including Bill Cox, Jim Giattina, and Marjan Peltier from the EPA Region 4 Water Division.
  - Two bioretention experts from Barr Engineering provided a two day workshop in November 2006 on bioretention and bioinfiltration practices. They studied this project site and provided input into the design of the bioretention zone. The site was also visited by the over 80 participants of BOB Bioretention workshop.
  - A group of Emerging Green Builders from the US Green Building Council toured an open house and site in November 2006.
  - The site was also a stop for 40 participants on the stormwater practices bus tour of the Southeast Stormwater Association annual conference.
  - The BOB program was also chosen for site visits by EPA Administrator Johnson and Region 4 Administrator Jimmy Palmer during their national projects tour in August 2007.
  - The BOB Committee meeting in February 2007 provided a talk by Steve Evans, with Third Rock Consultants, about microbial source tracking, with specific reference to the Franklin Branch monitoring on this site.
  - The BOB program and sites were highlighted on the national HGTVPro.com television show and website during their “green building month” in April 2007.

HGTV producer interviews the developer, Jennifer Deal, with Affordable Housing Resources, outside the EarthCraft House certified model home.

EPA Administrator Steve Johnson (left) and Region IV Administrator Jimmy Palmer (right) spoke to a gathering at the Morgan Park Place BOB site in Historic Germantown. EPA Administrator Steve Johnson chose the BOB program as one of his stops on a national tour of EPA success stories.

Project Activities - Stream Restoration and Monitoring

- The stream segment of Franklin Branch on this site was previously degraded due to development in the region. A sewer crossing at an improper angle and increased impervious cover in the subwatershed has led to flashy flows, bank erosion and undercutting of the banks.
- As part of the site work, a stream restoration plan for this section of Franklin Branch was finalized and implemented in summer 2007. The restoration work included: 1) re-establish a bank slope of 3:1 to 4:1 for a stretch of about 300 feet; 2) stabilize the streambanks with heavy matting and rip rap; 3) remove exotic invasive plants; and 4) replant the riparian zone with all native trees and shrubs.

- The restoration work was timed to be outside of the breeding season of the Nashville crayfish and the stream was swept for their presence daily before any work was done.
- The restoration work was done in partnership with Barge, Wagoner for design, Invasive Plant Control for exotics removal, Mid-TN Erosion for streambank modifications, GroWild for native plants, and Gardens of Babylon for watering of plants during drought conditions.
- In-stream monitoring was not possible in summer and fall this year due to extreme drought conditions.
- Site runoff monitoring continues to be a challenge for this site. The ability to collect storm event samples is logistically difficult due to site drainage issues and equipment constraints.
- We continue to seek models and experts to design a better way to measure site runoff during storm events.
- Two experts from Barr Engineering (Wisconsin) studied the site as part of their work in presenting the bioretention workshop in November 2006. They provided input into suggested bioretention practices on the site and ideas on monitoring methods. The engineering firm for the developer used their input to create preliminary design changes for the proposed new bioretention zone on the site.
- Severe exceptional drought conditions resulted in the stream being dry for several months in the summer and early fall of 2007. These dry conditions precluded any water monitoring on the site for a prolonged period.
- Construction on the phase two section, which was due to begin in early 2007, has been delayed by the developer due to the downturn in the housing market and cost constraints. The phase two area has been essentially undisturbed during this time period, except for placing a gravel top to the previously rough graded road beds.
- It is possible that the phase two section may be sold to another developer. If that occurs, the project will seek a partnership with that new owner to continue the monitoring work already begun. We do not anticipate that the change in ownership will disrupt the project activities.
- Funding to date for the project site work thus far has been from the original EPA Watershed Initiative Grant. This grant was completed on September 30, 2007. 319 funding will now begin to be drawn down to complete the monitoring on the site.

Next steps for the project:

- Bring in experts with similar monitoring experience to finalize a monitoring plan
- Secure a firm to implement the plan
- Begin storm event sampling as soon as practical both in-stream and site runoff.
- Begin phase two site construction and construct the bioretention zone when the market permits the developer to begin work again
- Post detailed project information on the new Cumberland River Compact website

PROJECT NAME: Cumberland River Basin Watershed Stakeholder Meetings Process
GRANTEE: Cumberland River Compact
GRANT YEAR: FY2005

Website: http://www.cumberlandrivercompact.org/

The Cumberland River Compact continues to actively work in its eighth watershed area, the Collins River Watershed. Building on the focus groups and first stakeholder meeting, an additional seven stakeholder meetings were held with an average of 7 attendees (please refer to table below). Additional outreach efforts in the community were held through presentations to the Rotary and Exchange Clubs with an average attendance of 30 people. The Watershed Program Director also spoke at Tennessee Wildlife Resources Agency Annual Rare Fishes Conference to an audience of approximately 100 on Compact work in the Collins Watershed. The Watersheds Director also published a special feature article in the Southern Standard newspaper on the April *Land Owner's Guide to Sustainable Forestry* presentation. Our relationship with Bridgestone Americas, a large employer in the area, resulted in the company providing meeting space for all future meetings at their training center in Morrison.

The stakeholder meeting process in this watershed has proven to be more complex than in other areas of the Cumberland River Basin. The average per capita incomes for Grundy and Warren Counties are $20,000 and $24,000, respectively, making the top priorities of local governments and citizens not water quality and quantity, but economic growth, tourism, and development. There also exists an attitude in the Collins River Watershed that the overall water quality is good so why discuss the matter. Stakeholder attitudes are also still inflamed from the Collins River being designated as a Tennessee Scenic River. This designation was eventually reversed, due to citizen lobbying and protest. All of these factors have combined to create a unique situation for the Cumberland River Compact. Simultaneously, members of the Caney Fork Watershed Association, the Collins River Watershed's downstream neighbors, have expressed interest in working with stakeholders in the watershed, through education and outreach events partnering on grants. With this

Participants in the Collins River watershed meeting.

involvement from the Caney Fork Watershed Association, an additional year to cultivate relationships with stakeholders and further promote water quality improvements, the Compact will have appropriate time and resources to successfully complete a watershed restoration plan with buy-in from all stakeholders.

Oakland Branch (Siltation, Riparian Loss – Land development, urban runoff)

Efforts also continue to strengthen the watershed groups in the Cumberland River Basin. South Fork and Old Hickory Watershed Association completed strategic planning exercises. Other groups received fundraising assistance. Stones River Watershed Association received guidance on developing a corporate donor/giving policy, Old Hickory Watershed Association was provided with a membership brochure, and Caney Fork Watershed Association received grant management assistance on a federal grant from Natural Resource Conservation Service. In addition to the organizational support, we also trained groups on various topics on watershed management. River Network provided training on the Clean Water Act with over 35 people in attendance. We continue to hold quarterly Cumberland Basin Council meetings to share our successes and lessons learned. We are looking to coordinate basin-wide events such as boat days and clean ups to build the visibility of all our watershed groups.

Presentation Date	Presentation Topic	Number of Participants
1/18/07	Smart Growth and Better Site Design, Dodd Galbreath, Senior Planner, Infrastructure Services, URSCorp.	7
2/15/07	Flood Control and Flood Plain Development Don Martin, Tennessee Dept. of Economic & Community Development	7
4/26/07	Landowner's Guide to Sustainable Forestry: Maximizing Profits While Protecting Water Quality presented by Rick Merinar, Chris Carney and John Fenderson of the Tennessee Department of Agriculture	7
5/27/07	Conservation Incentive Programs, with information presented by: Brad Bingham, US Fish & Wildlife Service; Mark Thurman, Tennessee Wildlife Resources Agency; Josh Kuhn, The Land Trust for Tennessee; Chris Wolkonowski, Natural Resources Conservation Service; Chris Carney, TN Department of Ag,	7

	Division of Forestry	
6/19/07	Educational presentation on the Alliance of the Cumberlands by Katherine Medlock, the organization's Executive Director.	9
7/24/07	Richard D. Martin, Senior Project Manager, Griggs and Maloney & Bryson James, Collins River Preservation Association	7
	Movie screening, Vic Scoggin's Swim of the Cumberland River, and panel presentation and discussion of watershed associations in the Cumberland River Basin. The panel included representatives from the Stones River Watershed Association, Harpeth River Watershed Association, Caney Fork Watershed Association, and Old Hickory Watershed Association.	
8/21/07	Movie screening, Vic Scoggin's Swim of the Cumberland River, and panel presentation and discussion of watershed associations in the Cumberland River Basin. The panel included representatives from the Stones River Watershed Association, Harpeth River Watershed Association, Caney Fork Watershed Association, and Old Hickory Watershed Association.	13

PROJECT NAME: Cumberland River Basin Watershed Stakeholder Meetings Process
GRANTEE: Cumberland River Compact
GRANT YEAR: FY2006

Website: http://www.cumberlandrivercompact.org/

The Cumberland River Compact (the Compact) is beginning to see a revitalization of interest in our second year in the Collins River Watershed. The first meeting had 17 people actively engaged in conversation. Jimmy Smith, TN Dept of Environment & Conservation began the meeting revisiting the Collins River Watershed specifically looking at the 303d impaired streams, the conversation built on this discussion with Mark Thurman, TN Wildlife Resources Agency explaining how to identify and prioritize projects, and Debbie Eskandarnia, Caney Fork Watershed Association, completed the conversation by sharing

project examples and ideas of where to begin. The meeting concluded with an exercise where participants discussed how they would identify and prioritize projects that can lead to the enhancement of water quality. They shared ideas such as restorations, public educational efforts, and adopt-a-waterway programs. Some stakeholders expressed interest in conducting a stream cleanup in the near future. Also during the exercise, a group of government agencies discussed the creation of a technical stakeholders meeting. The goal of this gathering is to serve as an information exchange which will lead to better project coordination among multi-agency staff. With the assistance of Mark Thurman, TN Wildlife Resources Agency, a van tour and information exchange meeting will be held in December/January. We also plan to recreate the watershed tour for the stakeholders where the agency staff will provide educational opportunities throughout the tour.

Oakland Branch – stream rechannelizing with almost no riparian buffers. This stream transects through the middle of a cow pasture.

In addition to building this technical network, the Caney Fork Watershed Association agreed to become an active participant in the Collins stakeholder process to help provide a local watershed perspective. We found this partnership invaluable during our October meeting. Many stakeholders strongly related to projects the Caney Fork Watershed Association completed and views the organization as a neighbor with similar land use concerns. Debbie Eskandarnia, Project Director for the Caney Fork Watershed Association, agreed to attend all future stakeholder meetings. We believe if the stakeholder participants do not feel comfortable implementing the watershed restoration plan by the end of the grant period, Caney Fork will be in position to lead the group forward in the implementation of the watershed restoration plan.

Oakland Branch – this picture highlights the change in land use along US70. New subdivision developments and street widening projects are occurring alongside and east of Oakland Branch.

Our next meeting is scheduled for November 5, 2007 where the discussion will build on our impairment discussion highlighting sedimentation concerns in the 303d list streams. Vena Jones, Local Officials Water Curriculum Program Director, with the Compact will introduce the Local Officials program and share projects that can reduce sediment erosion from various landowner perspectives (agriculture, pasture, single family home, etc.). The Watersheds Director continues to reach out to the TN Nursery Association, Soil Conservation Districts, and local associations to identify landowners to become engaged in our stakeholder process. The Watersheds Director will also continue to identify watershed restoration plan success stories. We continue to build on this early success and to engage and empower the Collins stakeholders creating a watershed plan that will be carried out to futher improve the water quality conditions in the Collins River Watershed.

PROJECT NAME: Quality Growth Tool Box Pilot Project
GRANTEE: Cumberland Region Tommorrow
GRANT YEAR: FY2006

With this contract, Cumberland Region Tomorrow has entered a new phase of our Quality Growth Tool Box project. Now that the material has been developed, we are beginning to implement the training. Since the start of this contract (June 7, 2007), we have had three pilot trainings in Robertson, Maury, and Wilson Counties. We have then gone on to conduct one "live" Toolbox Training Course for over 100 government officials and planning professionals in Sumner County. Prior to any of these pilot or "live" events we had a workshop to train a select group of professionals in various fields (architects, planners, etc.) in how to use the Tool Box curriculum in their communities. What you see below is a pictorial review of most of that work.

Sumner County

Over 100 planning commissioners and planning professionals from Sumner County were trained at the Gallatin City Hall on the Quality Growth Toolbox.

Lebanon, TN

Cumberland Region Tomorrow is working with professional partners; the American Institute of Architects, Nashville Civic Design Center, Middle TN American Institute of Architects & the University of Tennessee on the AIA 150 BluePrint for America Visioning Workshop for the City of Lebanon. This is the second of three communities that CRT is working on with AIA 150.

The project is focusing on Lebanon's town center and its neighborhoods' strengths, weaknesses, opportunities and threats and the potential of transit-oriented development. The results of the two day charrette demonstrated support for a comprehensive plan for the city of Lebanon. In February 2008, CRT will facilitate a Quality Growth Toolbox Training to Lebanon's planning professionals and commissioners.

Robertson County/Springfield, TN

Cumberland Region Tomorrow is working with professional partners; the American Institute of Architects, Nashville Civic Design Center, Middle TN American Institute of Architects & the University of Tennessee on the AIA 150 BluePrint for America Visioning Workshop for Robertson County. This is the first of three communities that CRT is working on with AIA 150.

As a result of the two-day charrette, results demonstrated support of a county-wide comprehensive plan. A leadership team composed of County Mayor Bradley, City of Springfield manager Gina Holt, and Robertson County Chamber of Commerce Executive Director Margot Fosnes commissioned an advisory committee to research comprehensive planning. Cumberland Region Tomorrow facilitated three educational sessions along with a Quality Growth Toolbox Training over the past four months and the board will be making a decision in early 2008 to move ahead.

Over 100 citizens from all corners of the county attended the two-day charrette and returned for the outdoor Roll-Out Event in September where the preliminary results were presented and the leadership was kicked off.

Toolbox Trainer Workshop

Cumberland Region Tomorrow relies on professional expertise to assist with the Quality Growth Toolbox training in the respective pilot counties. In order to accomplish this and maintain consistency, 40 professionals ranging from architects, planners, engineers to landscape designers were trained at the Nashville Civic Design Center in August. Jim Daisa of Kimley Horn and Associates was flown in from San Francisco to be the lead educator.

PROJECT NAME: Crooked Fork Restoration Project
GRANTEE: Emory River Watershed Association
GRANT YEAR: FY2004

The Emory River Watershed Association (ERWA) is leading a effort in Morgan County Tennessee to identify and remediate sources of non-point source pollution contributing to the degradation of Crooked Fork Creek and Flat Fork Creek. Both are listed as 'not supporting' their designated uses and are consequently on the 303(d) list. Many of ERWA's efforts this year have been focused on collecting, compiling, assimilating and analyzing information and data from the Crooked Fork Watershed for inclusion into the watershed management plan. The data and information were collected by volunteers as well as ERWA and TVA staff. The watershed management plan was developed by TVA, ERWA and Morgan County Soil Conservation District and submitted to TDA as a proposal for a future 319 project. We recently learned that this project has been awarded to SCD. ERWA and many other organizations will be partnering on this continued Crooked Fork restoration project.

The annual ERWA Discovery Festival was held again this year in downtown Wartburg. The main focus for holding the Discovery Fest is to highlight the accomplishments of ERWA and it's programs/projects which include the Crooked Fork Restoration project as well as the Crab Orchard Creek Restoration project. Many local residents as well as regional visitors attended the festival and were introduced or updated on the projects that promote water quality in Morgan County.

An exciting aspect of the Crooked Fork Restoration Project has been the cooperation between the Morgan County Correctional Facility, TVA, Tennessee Stream Mitigation Program, ERWA, and NRCS. Flat Fork Creek that runs through the prison property, is isted on the 303(d) list as impaired. Historically there has been little interest by the prison to improve this section of stream. As the prison is undergoing expansion, we felt the time was right to approach the MCCX to solicit interest in becoming a partner in our restoration efforts. To this point the relationship has been nothing but parsimonious and all involved are optimistic about the opportunity to get Flat Fork delisted through the TSMP.

ERWA, with assistance from TVA, held a riparian seedling distribution aimed at the residents of the Crooked Fork watershed. Ten species of riparian trees were sorted and bundled with help from the Wartburg Central High School's FCCLA students. The trees were passed out at the NRCS office along with literature explaining the benefits of riparian vegetation and a short questionnaire on where the seedlings would be planted.

PROJECT NAME: Cash Hollow Watershed Restoration Plan
GRANTEE: First Tennessee Development District
GRANT YEAR: FY2005

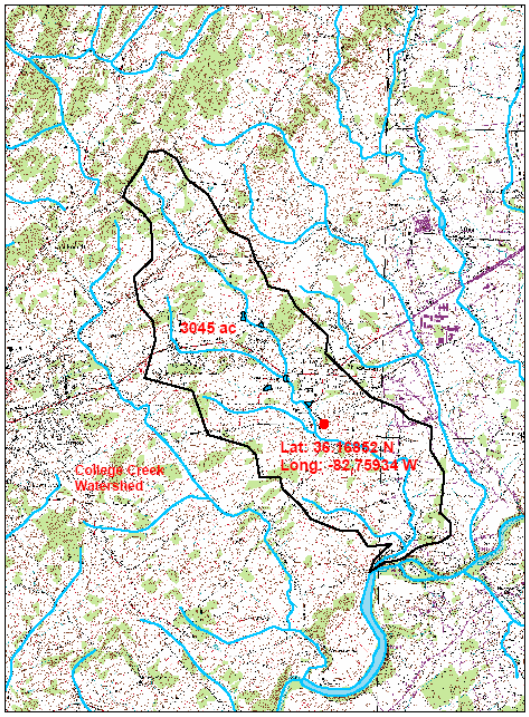
Website: http://www.ftdd.org/

The Cash Hollow Watershed Restoration Plan is being developed by the First Tennessee Development District in consultation with many partners including the Boone Watershed Partnership and Sinking Creek/Cash Hollow Watershed Alliance. Water quality and land use survey data will be incorporated into the plan once final analysis is completed. Twelve months of sampling and survey data will be evaluated and included in the plan. Over the past year, the District has made several reports to Boone Watershed Partnership and Sinking Creek/Cash Hollow Watershed Alliances.

Over the next year, we will be compiling existing data and land use surveys to develop a list of possible Best Management Practices needed in the watershed. Partners from East Tennessee State University and the Boone Watershed Partnership will be actively involved in the process of selecting BMP's. The Cash Hollow Watershed Restoration Plan is approximately one third completed to date. The following photographs highlight the water quality issues surrounding the efforts to rehabilitate Cash Hollow Watershed and the possible obstacles to developing a sustainable watershed restoration plan.

PROJECT NAME: College Creek Restoration Watershed Plan Development Project
GRANTEE: Greene County Soil Conservation District
GRANT YEAR: FY2005

Progress continued toward the completion of the Watershed Restoration Plan for College Creek. On October 23 a second meeting was held with TDOT concerning the volume of runoff from 11E by-pass in the College Creek area. Rick Noseworthy of TDOT Green Highways indicated they will participate to the greatest degree possible to reduce runoff from the highway. A small detention pond near the junction of the highway and the creek was agreed upon for 3rd funding cycle under 319.



A discussion has continued with Niswonger Foundation to complete the application for grant funding in association with the educational part of the College Creek 319 WAP. Six new questions were submitted and answered at this time.

A meeting was held with the developer and the engineering firm for The Meadows subdivision to discuss the total lack of post construction storm water detention. It was agreed to set aside about 1/3 ac of land near College Creek to collect and detain storm water runoff. The cost of the land is in excess of the land owners share for the work to be accomplished and will be deeded to the Home Owners Association prior to development of the detention facility.

On October 31, a draft copy of the Watershed Restoration Plan was submitted to the review committee (Sam Marshall, TDA; Brad Bingham, USFWS; Chris Cooper, TVA; and Middle Nolichuckey Watershed Alliance members). As a result of this review a

number of changes were made in the technical content and some format changes were made to the draft of the Plan.

On November 16, a presentation was made to the entire Middle Nolichucky Watershed Alliance for their input. A few more minor changes were made as a result of this presentation. On November 30, the final corrected Watershed Plan and 2007 Work Plan was submitted to TDA-NPS via email.

In Mid July 2007 minor revisions to Budget and schedule were made to the Plan because of the timing of the award. Most of the milestones were predicated on an early spring award of the College funding.

Typical streambank conditions along College Creek

A part-time contract employee was retained on August 20, 2007 to assist with creek data gathering and construction monitoring. This contract is for the period of August 20 through December 31, 2007. An evaluation will be made at that time concerning a need for these services into the New Year.

Based on the anticipated award of the Grant an RFP was released on August 28 soliciting Civil and Environmental Engineering assistance for the redesign of the Ingles and Meadows detention ponds and preliminary work on the rain harvesting project at Tusculum College. Closing date for proposals was September 14, 2007.

On September 28, 2007 the final signed contract for College Creek 319 Restoration was received with the effective date of the contract being August 16, 2007.

PROJECT NAME: Rutherford Creek Watershed Restoration Plan
GRANTEE: Harpeth River Watershed Association
GRANT YEAR: FY2003

HARPETH RIVER WATERSHED ASSOCIATION

Website: http://www.harpethriver.org/

In 2007, the Harpeth River Watershed Association (HRWA) successfully accomplished several key aspects of the Harpeth River Watershed – Phase III Project. Much substantive work was done in support of milestones focused on general water quality/conservation education and outreach around best management

practices (including continued publication of the Voices of the Harpeth Newsletter and Downstream News online e-blast, as well as the organization and delivery of a variety of workshops and presentations throughout the watershed aimed at youth and special interest audiences). Other highlights included the sponsorship of the first annual Harpeth River Rally, a member/donor appreciation event, the completion of the *HRWA Volunteer Bank Erosion Study* and presentation of outcomes at this year's American Water Resources Association (AWRA) Conference. During this time, the HRWA also completed various on-the-ground restoration practices focused on bank stabilization and riparian enhancement and formalized a set of criteria for measuring the effectiveness of these practices in the *BMP Assessment Report*. HRWA also continued to serve on several key working groups and committees focused on water quality, including the Tennessee Water Groups, Keep Williamson Beautiful, the Williamson County Stormwater Appeals Board, the MS4 Working Group, and more. HRWA played a critical role in facilitating further discussions on TMDL requirements, meeting with the Tennessee Working Group and TMDL staff at EPA Region IV to urge the reevaluation of the nutrient enrichment/DO TMDL for the Harpeth River.

Installing cedar revetments for bank stabilization with the JROTC in the Harpeth River Headwaters, near Eagleville, TN

Other major accomplishments and deliverables focused on the Harpeth River Headwaters, the priority subwatershed identified as a project outcome. These included, microbial source tracking in the Headwaters, as well as the writing of the *Harpeth River Headwaters Nutrient Study*, orchestration of the 3rd Annual Earth Day Event at the Eagleville School, hosting of a community-wide meeting in Eagleville (during which significant findings on bacterial contamination of local waters was addressed) the creation of the *Harpeth River Headwaters Restoration Plan*, and the implementation of BMPs in critically-impaired locations, including the Harpeth River Spring and other 303(d) Listed streams. HRWA also helped to facilitate the formation of the Eagleville Wastewater Advisory Committee, the primary objective of which is to investigate alternative sewer options for the city. HRWA continued to educate key landowners on the advantages of agricultural BMPs for water quality and livestock husbandry and to identify potential priority projects for future targeted practices to address cattle in creeks, bank instability, erosion and nutrient inputs due to livestock, as well as bacterial problems linked to failing septic systems. These and

other activities detailed in the close-out report have laid a foundation for further implementation work to be done in the Eagleville area under a current 319(h) grant.

PROJECT NAME: Post Oak Creek Watershed Plan
GRANTEE: Hull-York Lakeland RC&D Council
GRANT YEAR: FY2006

In the past year, the Hull-York Lakeland RC&D Council has made the following points of progress towards completing the Watershed Plan for Post Oak Creek:

1. developed an agreement with TDEC and Tennessee Tech University biology department to provide additional background water quality data.
2. mailed notices to landowners within watershed to explain project and notify them of an upcoming public meeting.
3. published news articles in local papers to notify the public of proposed project and the public meeting.
4. hosted our first public meeting on March 13, 2007.
5. met with representatives from TDEC, TDA, and NRCS on April 20, 2007 to tour watershed and select sampling and project sites.
6. sampling conducted by other parties during summer of 2007.

PROJECT NAME: WaterWorks! – Phase III
GRANTEE: Middle Tennessee State University – Center for Environmental Education
GRANT YEAR: FY2005

Website: http://www.tennesseewaterworks.com/

The WaterWorks! Program milestones for this grant include designing, creating and distributing new television and radio ads through the TN Association of Broadcasters (TAB) network. Our "Tennessee Homeowners' Guide to Cleaner Water" brochure was reprinted and continues to be requested in both print and CD form. The CD (which contains two high-resolution designs, an 11x17 color poster and teacher activity, and a black and white student page) is available free by request from the WaterWorks! program and is currently being used by storm water and water quality programs across the state. Brochures and other program materials were distributed through public events such as the Catfish Rodeo, environmental fairs, Earth Day events, watershed groups and educational events.

On our website, **www.tennesseewaterworks.com**, the watershed map continues to be updated to include "stand alone" watershed maps for 34 TN watersheds, including those in or near the Phase I cities and corrections to maps and program information regularly requested by storm water programs and watershed groups. Throughout the year, the

WaterWorks! program continued to promote water quality through training partnerships and conference presentations throughout the state.

Karen Hargrove represented the WaterWorks! program at Murfreesboro's "Kid City" 2007. Karen worked with Greg Upham (Storm Water Management Coordinator for the Town of Smyrna, TN) to teach the children about storm water.

PROJECT NAME: WaterWorks! – Phase IV
GRANTEE: Middle Tennessee State University – Center for Environmental Education
GRANT YEAR: FY2006

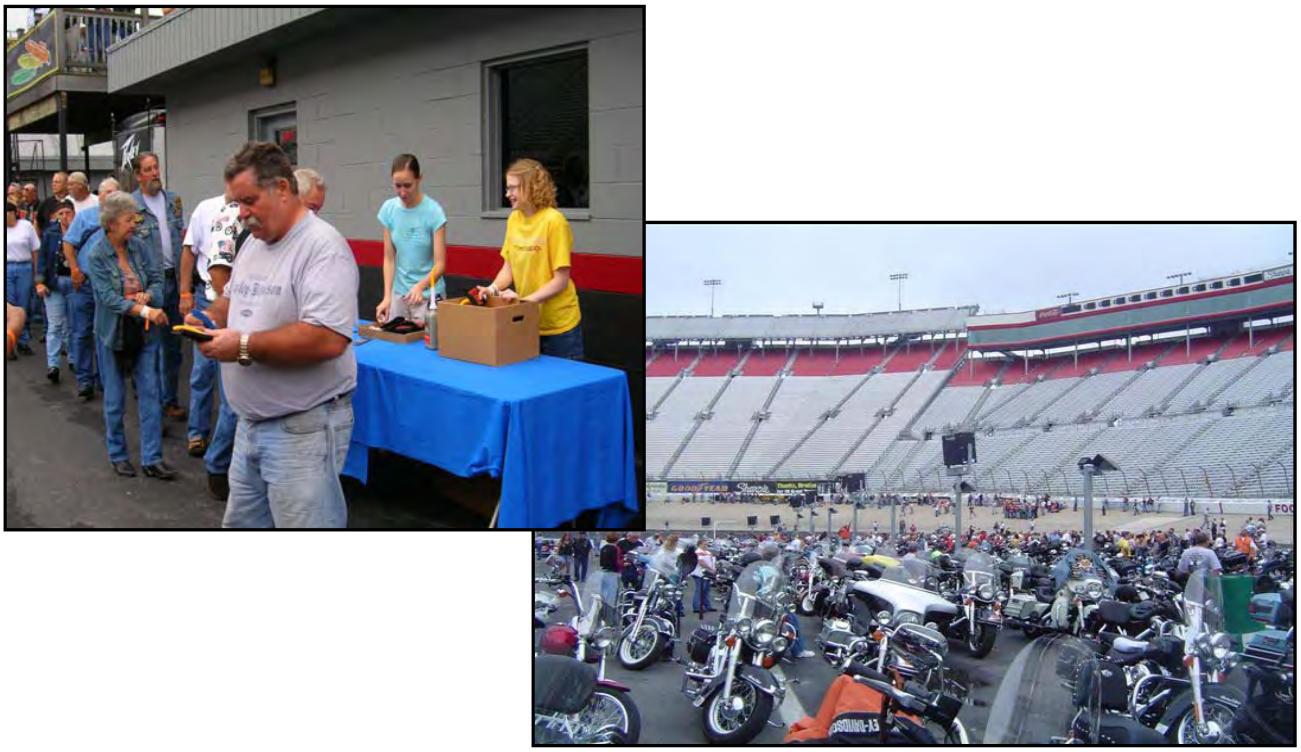
Website: http://www.tennesseewaterworks.com/

The WaterWorks! Program milestones for this grant include editing and completing the production of the selected 3 radio and 3 television ads from the EPA "Toolbox". The Toolbox had a limited number of ads that could be edited for use in our program, but with the help of our contracted agency we were able to edit selected Toolbox ads to work in our program and for Tennessee.

We have completed work on our "trilogy" of print media (brochures and CDs) that begun in an earlier phase of the WaterWorks! program. The "Tennessee Farmers Guide to Cleaner Water" and the "Tennessee Construction Guide to Cleaner Water" have been completed, printed and distributed. Due to popular demand from storm water programs and citizen groups, the first brochure, "Tennessee Homeowners' Guide to Cleaner Water" was reprinted and continues to be distributed.

Our website, **www.tennesseewaterworks.com**, has been extended, maintained and updated. It continues to be our 'face' to the state and is updated with current contact

information for the 85+ Phase I and II storm water programs and watershed/water quality groups on a regular basis.



WaterWorks! was represented at the 2006 Harley Davidson Tennessee State Rally in Johnson City, TN. WaterWorks! worked alongside TDEC to educate the riders about the impact they have on streams.

PROJECT NAME: Cathy Jo Branch Watershed Plan
GRANTEE: Nashville Zoo
GRANT YEAR: FY2005

Implementation of the Watershed Management Plan developed for the Nashville Zoo, particularly the planning components, has moved ahead during 2007 at a slower pace than anticipated. Delays have been associated with changes in the technical team personnel assigned to the various projects by the consultant supporting the effort. In addition, funding availability has adversely impacted the implementation of the several of the physical projects comprising portions of the plan. That work has begun to pick up momentum with the efforts of other members of the technical team and funding commitments by local donors and sponsors. The *Watershed Management Plan for The Nashville Zoo at Grassmere* was approved in November 2007. Specific measures to restore individual reaches of Cathy Jo Branch to improve overall water quality are now planned for 2008. Approximately $200,000 to $400,000 of expenditures is planned for water quality/management improvements planned in 2008, subject to funding availability and regulatory concurrence.

PROJECT NAME: South Fork Watershed Restoration Planning and Education
GRANTEE: South Fork Watershed Association
GRANT YEAR: FY2005

The Goal of the South Fork Watershed Association (SFWA) is to work to protect and enhance sustainable and healthy water resources in the South Fork Watershed, though educating and motivating the community about water issues, implementing and evaluating water issues in the watershed, and organizing and coordinating the efforts for the community and the South Fork watershed. The SFWA goals for this project are to establish the SFWA as a 501(c)3 nonprofit organization, assess and prioritize stream segments for restoration planning and education, develop a watershed restoration plan, and build public awareness through water education.

In 2007 the SFWA had the following accomplishments:

- Established the SFWA as a corporation and has completed the paperwork for filing with the IRS for our 501(c)3 status.
- The group has continued our educational program with the local Boys and Girls Club through the annual Bear Creek and the Flat Creek Clean ups and Nature Hike at Burnt Mill Bridge.
- The SFWA was able to have brochures made for the SFWA to help increase community awareness about the SFWA and our watershed.
- The group is continuing its work with the Water Watch Program in Scott County and continues training sessions in the watershed to expand our volunteer base and help educate the community about water issues in our watershed.
- The group has continued working with the Big South Fork National Park and Recreation Area, Office of Surface Mining, Tennessee Department of Environmental Conservation and local water managers to do stream assessments in our two sub watershed areas of Pine Creek and Flat Creek.
- The SFWA has been successful in getting additional support grants from the River Network ($5000) thru the help of the Cumberland River Network and is in the process of an OSM Intern support grant ($5000).

PROJECT NAME: Forestry BMP Education/Technical Assistance
GRANTEE: Tennessee Department of Agriculture, Division of Forestry
GRANT YEAR: FY2006

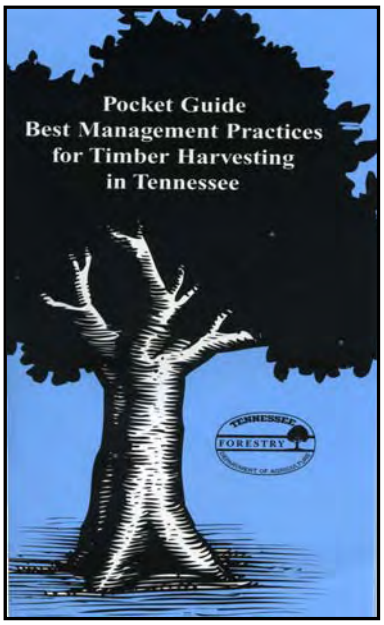
Website: http://www.state.tn.us/agriculture/forestry/tdfbp.html

The Division of Forestry has developed and implemented a comprehensive Forestry Nonpoint Source Management (NPS) Program. This program informs and educates foresters, the forest industry, and the general public about the potential for soil erosion and water pollution from forestry management activities. This project addresses TDA-NPS Management Program Milestone #5 (Improve the knowledge of stakeholders and citizens concerning the origins, magnitude, and prevention of nonpoint source pollution, and how to prevent it).

Landowner water quality education workshop at Sewannee.

Two of the Division's educational tools, the *Best Management Practices (BMPs) for Timber Harvesting in Tennessee* and the *Pocket Guide* version, were revised and printed. Program accomplishments also include BMP recommendations prepared for 1,019 landowners in forest management plans and timber sales assistance. 5 BMP training sessions were held in conjunction with the Tennessee Master Logger program, attended by 75 loggers.

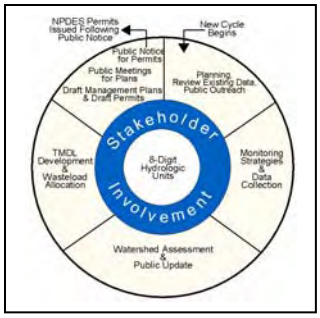
Twenty forestry water quality and BMP familiarization workshops were conducted for 452 resource managers, forest landowners, and loggers. TDA foresters investigated 17 complaints arising from forestry operations in cooperation with the Tennessee Department of Environment and Conservation, and investigated and made recommendations on 98 complaints from other sources.



Cover of revised BMP pocket guide

PROJECT NAME: Monitoring, Assessment, and TMDL Development Support
GRANTEE: Tennessee Department of Environment and Conservation – Water Pollution Control
GRANT YEAR: various/recurring

Website: http://www.state.tn.us/environment/wpc/



In 1996, TDEC began a watershed initiative to manage water program activities for water quality improvement. The watershed approach consists of five parts: planning and data collection, monitoring, assessment and allocation, drafting watershed plans, and implementation of watershed plans. This project assists with the assessment of watersheds through the five-year rotational watershed approach. Incremental grant

funds are also allocated to TDEC-WPC to support the statewide development of TMDLs. These projects are funded annually by TDA-NPS.

PROJECT NAME: Crab Orchard Creek Restoration Project, Phase I
GRANTEE: Tennessee Department of Environment and Conservation, Division of Water Pollution Control, Land Reclamation Section
GRANT YEAR: FY2005

Website:
http://tennessee.gov/environment/wpc/programs/abandmine/

During the period Oct 1, 2006 through Sept 30, 2007, Milestone 3 was completed and significant progress was made toward Milestone 6 (in lieu of Milestone 4). Milestones:

1. Within 6 months from the contract start date 1 article submitted to paper; 1 public meeting held; pre-reclamation monitoring of Eddie Walls Site.

Met and documented in 2006 Report.

2. Within 12 months from the contract start date 44 acres regraded and stabilized; complete baseline benthic monitoring at established TMDL sites.

Regraded and stabilized 44.8 acres at Eddie Walls Site (during 2006)
Completed baseline benthic monitoring at 5 of 7 baseline sites identified with Jonathon Burr, TDEC DWP. (during 2006 – postponed last 2 benthic collection monitoring until FY2008 due to staffing and drought issues).

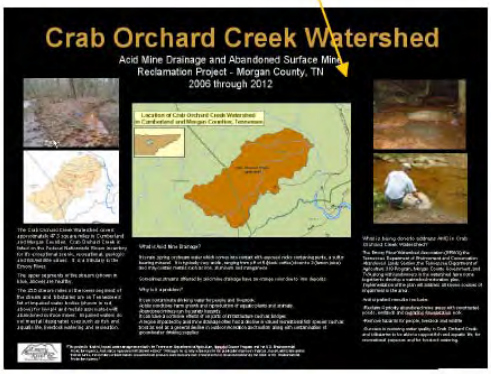
3. Within 18 months from the contract start date 1 article submitted to paper; brochure/display developed.

Milestone Completed:
Display created in 2006. Created and inserted Discovery Festival Flyer into newspaper with project information in lieu of article. In addition, coordinated and hosted the 2007 Morgan County Discovery Festival April 21, 2007. We showcased watershed project progress during this event with a booth and multiple announcements telling about the Crab Orchard Creek Project and other watershed improvement projects in the county. Approximately 400 people attended the Festival.

In addition, multiple Emory River Watershed Association Meetings were held with project updates to the Board/Membership about the Crab Orchard Project. Emory River Watershed Association is a local citizen organization.

Crab Orchard Display at Morgan County Discovery Festival

2007 Discovery Festival in Wartburg. Displays and staff were on hand to interact with the public and raise awareness about the Crab Orchard Creek project. An estimated 400 people attended the Festival. Announcements were also made to introduce the watershed projects, including Crab Orchard Creek.



Display developed during 2006.

The display is used for multiple special events including the annual Morgan County Discovery Festival

Discovery Festival Publication – inserted into local paper in lieu of article. (front shown on left; rear shown on right)

4. Within 24 months from the contract start date 2 limestone treatment ponds constructed; 1 wetland constructed; complete monitoring of Laurel Creek and Smith Branch.

*** During the period October 1, 2006 to September 30, 2007, Milestones #4 and # 6 were swapped for logistical reasons. Significant progress was made toward*

Milestone #6 in lieu of Milestone #4.

5. Within 30 months from the contract start date 1 article submitted to paper; 1 public meeting/outreach event

Plan to meet this milestone during next year of work.

6. Within 36 months from the contract start date 1 limestone treatment pond constructed; 1 wetland/settling pond constructed; 11 acres regraded and revegetated; 1 highwall and 2 existing sediment ponds backfilled; complete prereclamation monitoring of Fagan Mill Site; begin post-reclamation monitoring of Eddie Walls Site. *** During the period October 1, 2006 to September 30, 2007, Milestones #4 and # 6 were swapped for logistical reasons. Significant progress was made toward Milestone #6 in lieu of Milestone #4.*

Progress to Milestone #6: 90% complete. TDEC awarded a reclamation contract to Marcum Excavating, Oneida, Tennessee, on June 1, 2007. The contractor mobilized equipment to the site and began work on June 14, 2007**.** By September 30, 2007, 12.7 acres of abandoned surface mine have been regraded and both acid mine drainage treatment systems have been constructed. All disturbed areas are to be revegetated during October of 2007. See photos of progress below.

Backfilling Highwall at Little Laurel Site

Placing limestone for treatment system at Little Laurel Site

PROJECT NAME: Envirothon
GRANTEE: Tennessee RC&D Council
GRANT YEAR: FY2004

Website: http://www.tnrcd.org

The Tennessee Envirothon program is a competitive program for high school students. Working in teams of three (3) to five (5), students represent their schools in a regional competition. Regional winners advance to the state competition and state winners represent Tennessee in the North American Canon Envirothon. The Envirothon competition within Tennessee utilizes NPS issues as a vehicle by which wise resource usage and management is emphasized. The Envirothon program is designed to promote high school students' knowledge of natural resources in five (5) resource areas: aquatic, soils, forestry, wildlife, and a current environmental issue which changes each year. This year, the current issue was Renewable / Alternative Fuels. In addition, the Envirothon encourages cooperative decision-making and team building. Team building is taken to a higher level at the State and Canon Envirothon competitions, each team is provided a scenario based on the current issue and develop a team presentation which is judged on speaking ability, teamwork and knowledge of the subject matter. While each student on an Envirothon team is encouraged to do his or her best, the score that counts in the end is the TEAM score as students must make management decisions and judgments based on their knowledge and information provided. The competition cultivates a desire to learn more about the complexity of our natural resources.

Teams receiving instructions for the Water Resources portion of the examination from Dr. George Smith of UT Extension.

This year's competitions involved 132 teams from across the state which directly involved 645 students. These numbers are down from previous years primarily as a result with conflicting school schedules. We hope to remedy this problem through better scheduling and working more closely with school systems and other educational providers such as the Extension Service.

The winning team for the Tennessee Envirothon was Coffee County's 4-H which was made up of home school students. They have advanced on to the Canon North American Envirothon to represent Tennessee. They will compete in Geneva New York at Hobart and Williams College the week of July 30th. Teams placing in the top ten positions will win scholarships and photography equipment from the Canon Corporation.

By preparing for and participating in Envirothon, Tennessee students will develop interpersonal skills by working with other student team members and advisors in cooperative decision-making and problem-solving. The benefits of Envirothon are certainly long-term as we build informed and knowledgeable adults. Students will have the opportunity to work one on one with professionals in the field of natural resource management. Through this contact we anticipate increased interest career-wise in the field of natural resources and environmental management.

This year's 1st place team from Coffee County

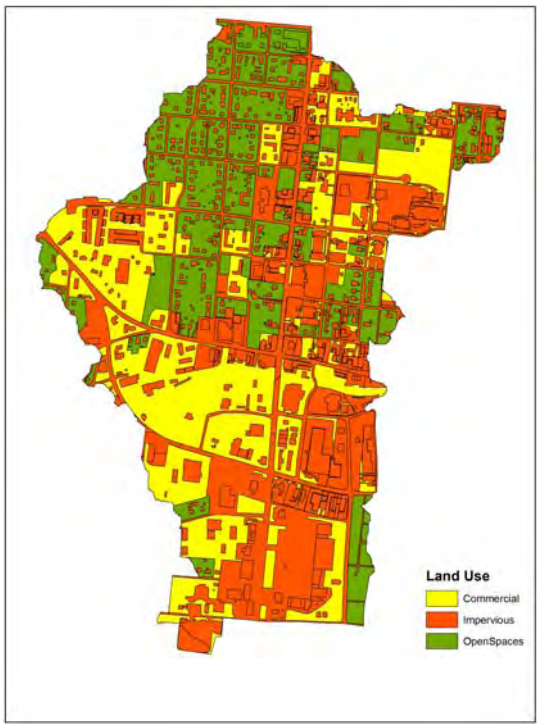
PROJECT NAME: Pigeon Roost Creek Watershed Restoration Project: Long-Range Comprehensive Plan
GRANTEE: Tennessee Technological University, Center for the Management, Utilization and Protection of Water Resources
GRANT YEAR: FY2004

Center for the Management, Utilization and Protection of Water Resources

Website: http://www.tntech.edu/wrc/

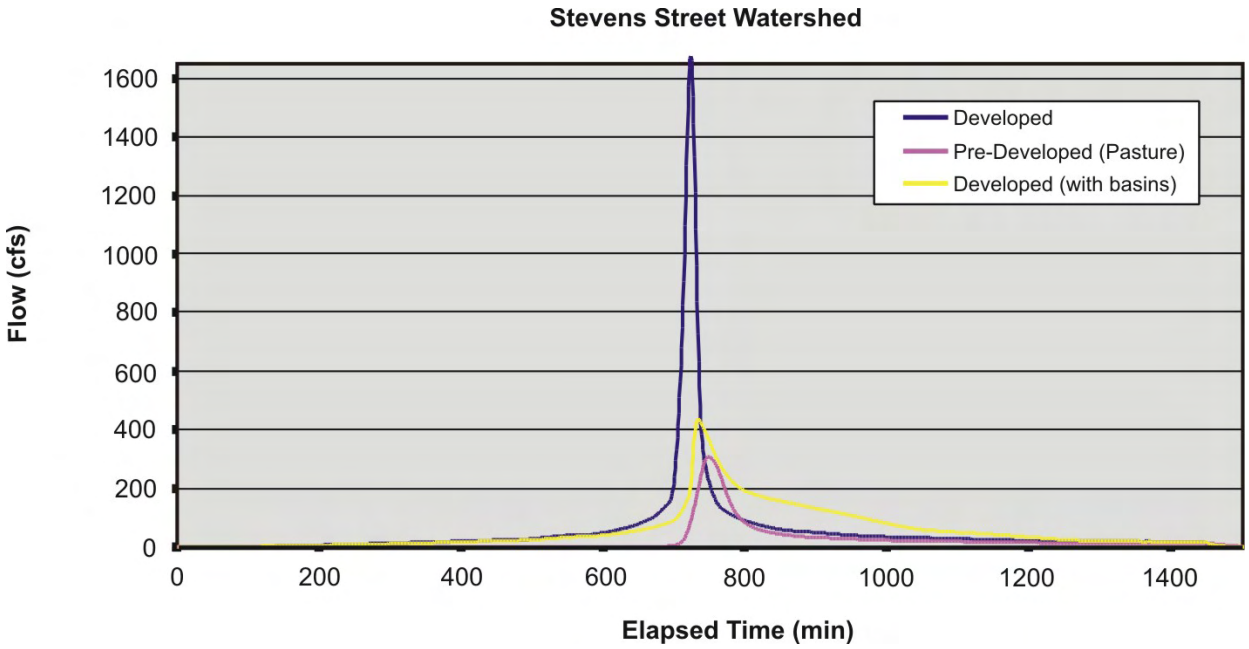
We presented storm flow data and model calibration data to members of the City of Cookeville Planning Commission October 12, 2006. We continued to determine water flow during storm events on February 13, 20, March 27, April 3,11,14, 26 and May 3 and 4. These events were used to calibrate the monitoring equipment and validate the water flow model.

Reviewed literature and compiled information on stormwater BMP strategies, watershed plans, and low impact development (LID). A thorough literature review was done comparing larger detention basins with traditional smaller site-by-site detention basins. Calculations were begun to evaluate effectiveness of LIDs such as rain barrels and porous pavement.



Land Use in the Stevens Street watershed.

Detention basins were modeled in the 326.4 acre subwatershed of Ensor Sink known as the Stevens Street watershed. Most major developments in this watershed took place prior to city ordinances requiring stormwater BMPS. The Stevens Street watershed was divided into 5 subwatersheds averaging 65 acres. The detention basins were modeled based on designing them at the watershed scale. This approach is more cost effective and avoids possible superpositioning problems. Basins were designed according to the City of Cookeville ordinances, which call for a reduction of flow rate to pre-developed conditions for storms with a 2, 5, and 10 year recurrence interval. This detention basin design was simulated using the reservoir element in HEC-HMS along with a storage-discharge relationship. The effect of rain barrels designed to capture the first half-inch of rainfall on residential rooftops was also modeled. The effect of replacing traditional parking lot paving with porous pavement was modeled for large commercial parking lots. They were simulated by adjusting lag time and CN for these areas. Also, the combined effect of these strategies was modeled, resulting in smaller detention basins needed. The flows of a 10 year storm and effects of detention basins only, showed that stormwater flow was about 30% higher than pre-developed conditions.



Stevens Street Watershed Comparing Developed, Pre-Developed as Pasture and Developed with Detention Basins for a 10 year storm.

PROJECT NAME: Tennessee Growth Readiness Program
GRANTEE: Tennessee Valley Authority
GRANT YEAR: FY2003

Website: http://www.tgrowth.org/
http://swan.southeastwaterforum.org/resources/files/tngrowthreadiness.pdf


Site Planning Roundtable Management Training, Murfreesboro, Feb. 2007

During the 2007 Fiscal Year, the Tennessee Growth Readiness Program hosted several training classes, made multiple presentations, and published a case study on a Green Roof demonstration project in Nashville, TN.

One Site Planning Roundtable Management Training session was held in Murfreesboro, TN with 43 participants in attendance. Through the workshop evaluations 86% of participants who responded plan to use what they learned in their job; 77% plan to evaluate their community's codes and ordinances and 91% will use the information to educate local leaders in their community.


Land Use Planning for Water Quality Workshop, Knoxville, July, 2007

In addition, the Land Use Planning for Water Quality curriculum was revised to encourage the inclusion of Green Infrastructure Planning into existing community planning process. Several new case studies and a new mapping exercise were developed as part of the revision. We worked with Tennessee Department of Economic and Community Development Local Planning Assistance Section to revise the workshop to be relevant and appropriate for the planning community in Tennessee. A pilot workshop was held in June, 2007 to gain additional input to the workshop curriculum and process. Two additional workshops were held with a total of 73 participants representing 16 communities. Through program evaluations an average of 78% of participants agreed or strongly agreed that the training would increase their effectiveness; 32 participants plan to undertake a natural resource inventory in their community; and 31 will develop a land conservation plan for their community.

A case study for the Westview Green Roof project was published and posted on the Southeast Watershed Forum Website: http://www.watershed-assistance.net/resources/files/Westview%20Condo%20Greenroof.pdf

In addition, during the year, we promoted the program at 9 meetings and conferences, including 2 national conferences.

PROJECT NAME: Big Rock Creek Project
GRANTEE: The Nature Conservancy
GRANT YEAR: FY2006

The Big Rock Creek Watershed Project is a continuation of a successful 5-year project that was completed in December of 2005. Contact has been made with nearly 20 landowners and 10 projects have been completed in the watershed. A total of 12,600' of livestock exclusion fence has been constructed and 6 alternate watering have been installed. One of these fencing projects in on the Giles farm in the upper section of Big Rock Creek and will protect over 6,000' of the headwaters. In addition, several large projects are in various stages of negotiation and initial implementation.

Exclusion Fence on the Bomar Farm

In terms of outreach and education efforts, these have been varied from agricultural and urban landowners to 4th and 5th graders. We have been working with the Marshall County s school system regarding the distribution of the mussel and water quality booklet, and are working to develop a stream management education program for urban homeowners. We continue to work closely with the City of Lewisburg on the heavily used and expanding greenway project through town. A crucial part of this program has been the ongoing education of Public Works staff regarding the proper management of urban riparian zones.

PROJECT NAME: Jonesborough Watershed Protection Project
GRANTEE: Town of Jonesborough
GRANT YEAR: FY2003

Website: http://www.jonesboroughtn.org/

Large detention basin at McCoy Circle

The Town of Jonesborough has completed work and plantings related to the three (3) detention areas in our Watershed Protection Projects. These include the upper and lower ponds within Mt. View Estates Subdivision and the large detention area associated with McCoy Circle. All grading and structural improvements have been completed at State Road Park. Because of severe drought conditions, Jonesborough did not undertake the planting of the rain garden and bio-retention area at Stage Road Park. In order to improve the non-point pollution effectiveness of the plantings, Jonesborough contracted with Equinox Environmental of Asheville, NC to establish a landscape design based on bio-retention and pollution control components. The design is complete and the plan attached. The water spreader aspect of the plan will be completed this fall and the plantings are scheduled for early spring.

PROJECT NAME: Forest-A-Syst – Phase II
GRANTEE: University of Tennessee Agricultural Extension Service
GRANT YEAR: FY200

Website: http://fwf.ag.utk.edu/Extension/forestasyst_files/frame.htm

The following summarizes annual activities achieved on the Forest*A*Syst Phase II Grant covering the period of 10/1/06 to 9/30/07. Most of the obligations for this grant were completed prior to October 2005. However, over the past twelve months, the Forest*A*Syst power point program (and accompanying publication) was delivered at one County Forestry Association (CFA's) evening meetings and at six forestry field days. These programs reached 248 forest landowners, collectively owning 37,200 acres of forestland.

The obligations for this contract have now been fulfilled, including an additional seven programs beyond those required. Over the four year period, a total of 43 educational programs were delivered, reaching 1,720 forest landowners, distributing over 2,000 Forest*A*Syst publications, and impacting an estimated 258,000 acres of forestland. Of the 806 participants that completed the pre-and-post survey, an encouraging 98.8 percent indicated they intended to adopt the best management practices addressed through

Forest*A*Syst. Further, these same participants showed a 103% gain in knowledge of the methods to reduce nonpoint water pollution in forestry operations.

Tennessee Division of Forestry addressing BMPs for the Wayne County Forestry Association.

PROJECT NAME: Forest-A-Syst – Phase III
GRANTEE: University of Tennessee Agricultural Extension Service
GRANT YEAR: FY2004

Website: http://fwf.ag.utk.edu/Extension/forestasyst_files/frame.htm

The following summarizes annual activities achieved on the Forest*A*Syst Phase III Grant covering the period of 10/1/06 to 9/30/07. Over the past twelve months, the Forest*A*Syst funds helped sponsor the start-up of two additional county forestry associations, bringing the state total to 48 counties. The F*A*S power point program (and accompanying publication) was also delivered to these associations. In addition, partnering with the Tennessee Forestry Division and the Tennessee Forestry Association, three regional forestry field days were held. Collectively, these 8 events reached 437 forest landowners, owning 65,550 acres of forestland.

Explaining the proper use of forest herbicides.

Across the three field days, attendee response and experience was positive. A total of 140 participants completed a survey at the end of the event. Participants were able to tour and view first hand the forestry best management practices that are practiced on the Tennessee State Forests, and 97% indicated that viewing the forestry practices first-hand provided them with a better understanding of forest management. Further 86% said they planned to implement something they had learned about. Landowners rated their knowledge of water quality protection after the workshop on a scale of 1 to 5, with 5 being highest. Knowledge level for water quality protection after the field days was 4.11. The tours of practices on state forests provided a quality educational experience for the participants, who had a generally low knowledge level in that area. Participants received valuable information that will enable them to more sustainably manage their forest lands, all while protecting the water and soil resources.

Landowners are instructed that well managed tree farms protect watersheds.

PROJECT NAME: Oostanaula Creek Watershed Plan
GRANTEE: University of Tennessee Agricultural Extension Service
GRANT YEAR: FY2006

Website: http://ocw.ag.utk.edu

Oostanaula Creek within McMinn and Monroe Counties of Tennessee is listed as an impaired waterbody due to pathogens (E. coli), phosphates and siltation. To successfully remove waters within the planning area from the Tennessee 303(d) list requires the following reductions: 67.7 percent reduction of pathogens based on the TMDL; 59.4

Scenes from the Oostanaula watershed.

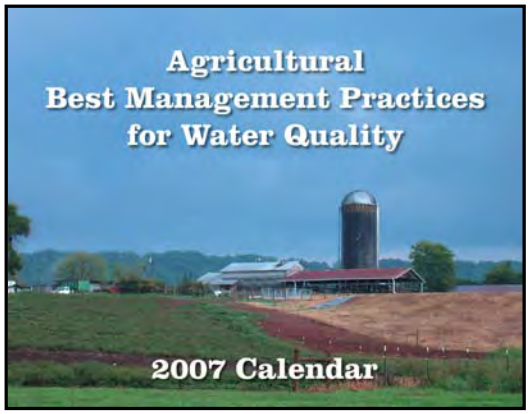
percent reduction in sediment based on the TMDL; and a 79 percent reduction of phosphorus based on Ecoregion reference streams. During 2007 the University of Tennessee Extension worked with partners with the watershed to finalize a draft watershed plan.

The plan is currently under review by the Tennessee Department of Agriculture. Approval and release of the final version of the plan should be completed before the end of the year. During the year several Oostanaula Watershed stakeholder meeting was held with representatives from TVA, NRCS, TDEC, TDA, McMinn County, Athens Public Works, Athens Utility Board, UT-Extension and EPA Region IV. In addition to developing a plan for addressing water quality issues in the watershed a website was developed. The draft plan is available for viewing on the web at http://ocw.ag.utk.edu

PROJECT NAME: Pond Creek Protection and Water Quality Improvement Project
GRANTEE: University of Tennessee Agricultural Extension Service
GRANT YEAR: FY2004

Website: http://pondcreek.ag.utk.edu/

Since 2001 the University of Tennessee (UT) Extension has been actively involved in monitoring water quality in Pond Creek, an agricultural watershed in parts of McMinn, Monroe and Loudon counties in eastern Tennessee. With support from the Tennessee Department of Agriculture and other agencies Ms. Lena Beth Carmichael an agent with UT Extension has been working with farmers and other stakeholders in Pond Creek to improve water quality in the watershed since 2003.



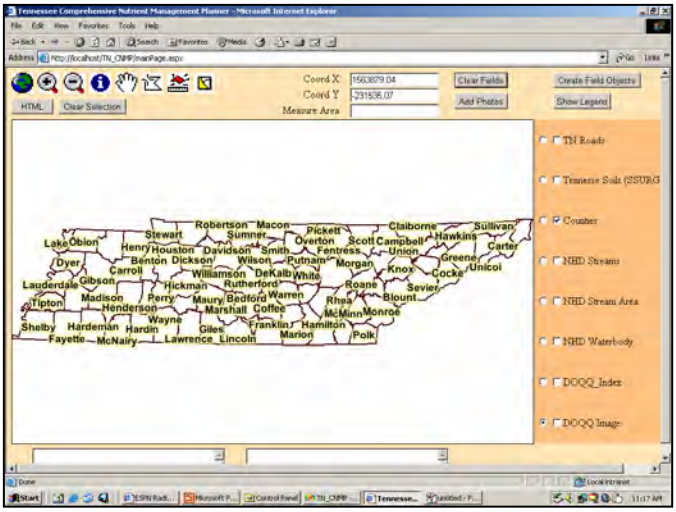
Front cover of 2007 Calendar highlighting BMPs implemented in Pond Creek

During 2007 a number of community and other outreach activities have been conducted in the watershed, including a day-camp for youth, the distribution of a 2007 calendar on best management practices for water quality as well as the installation of a number of new and improved animal waste systems and other best management practices on farms across the watershed. In October the UT Extension watershed team was awarded the team award at the Southern Region Water Quality conference in Fayetteville, AR.


Improved manure storage system built on a dairy farm in Pond Creek.

PROJECT NAME: Development of an Internet-based Farm Mapping Tool for use in Comprehensive Nutrient Management Planning in Tennessee
GRANTEE: University of Tennessee Agricultural Extension Service
GRANT YEAR: FY2003

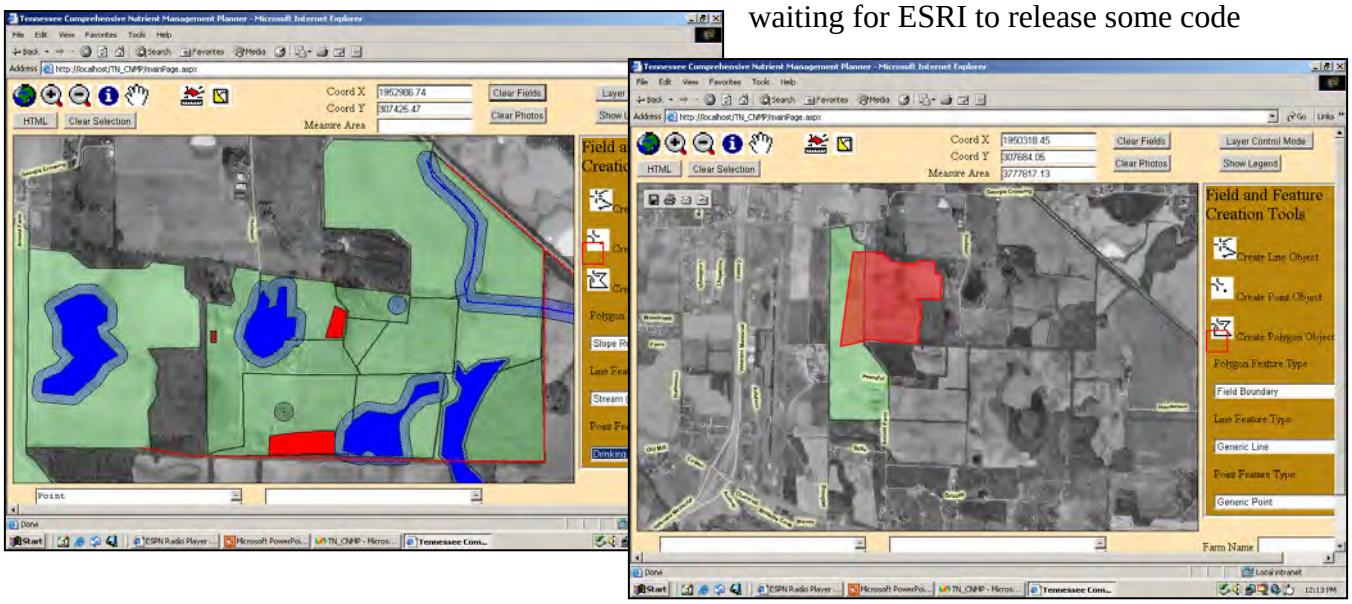
Website: http://gis.ag.utk.edu/tncnmp/



Starting page from the website (under development)

Since 2004, the University of Tennessee Extension has been developing an internet based farm mapping tool using ArcIMS (internet mapping software). Most of the programming work was conducted in 2005 using the .NET programming language. Little progress was made in 2007 but due to changes in personnel and more recently a change in policy by ESRI (the company that developed the ArcIMS software used in this project). ESRI recently announced that it would be focusing future development efforts on improving ArcGIS Server rather than ArcIMS since the ArcGIS Server architecture allows for a more flexible and functionally-rich system design. As a result, ArcIMS has been moved from an active development effort to a maintenance project. New development in ArcIMS will be very limited since the resources and effort will focus on ArcGIS Server

This announcement has implications for the completion of this project. We are currently waiting for ESRI to release some code



Examples of the delineation capabilities (of fields, streams, ponds etc.) of mapping tool

that will enable us to convert the work that has been done in ArcIMS over to ArcGIS. Dr. Joanne Logan is hoping to devote some time to this towards the end of the year – assuming the code is made available.

PROJECT NAME: Evaluating and Demonstrating the Repair of Failed Septic Systems
GRANTEE: University of Tennessee Agricultural Experiment Station
GRANT YEAR: FY2005

Website: http://onsite.tennessee.edu/

The KOA Kampground in Loudon County, Tennessee was identified as contributing human sewage to Mud Creek. It was found that the campground had a failed wastewater treatment system. After much issue with the regulatory community about how to repair the failed system, it was decided to use traditional septic system (primary treatment) with a pressurized effluent distribution system (final treatment).

Figure 1.

On March 19, 2007, the KOA Kampground was switched over to the new wastewater treatment system. After a few minor hiccups, the system has performed well. As seen in Figure 1, the effluent is being uniformly distributed across all the field lines. The new system is a low pressure pipe system. Fifty 100-foot laterals were installed to distribute effluent. Figure 2 shows the 1-1/4" diameter Schedule 40 PVC pipe with drilled 5/32" diameter orifices. The field lines and septic tanks were installed by KPGS Excavators out of Sweetwater, Tennessee (Figure 3). Distribution lines were placed in narrow, shallow trenches with 6 inches of gravel below the distribution pipe. As shown in Figure 4, this gravel provides storage until the effluent is absorbed by the soil. Mud Creek is within 300

Figure 2.

Figure 3.

Figure 4.

feet of the KOA Kampground. Dr. Alice Layton provided strong evidence that the failed system was contributing human source fecal bacteria to this creek. With the new system, and once we receive sufficient rainfall to generate flow in the creek, it is hoped that the human source bacteria will be greatly reduced from previous measurements.

Figure 1. Mud Creek - this is the creek we are improving by repairing the failed wastewater treatment system at the KOA Kampground.

PROJECT NAME: Grant Pool Program – Restoration of Impaired Watersheds
GRANTEE: Various soil conservation districts and RC&Ds
GRANT YEAR: FY1999-2004

From October 1, 2006, to September 30, 2007, a total of 154 BMPs were installed on 303(d)-listed streams, at a cost of $572,545.34. TDA continues to work through our partners to implement BMPs in impaired watersheds, with the goal of de-listing the stream reach from the 303(d) List. These BMPs are installed with the assistance of the USDA-NRCS field personnel, working with local Soil Conservation District offices.

PROJECT NAME: Stock Creek Watershed Restoration Plan
GRANTEE: Water Quality Forum
GRANT YEAR: FY2005

Website: http://www.waterqualityforum.org/default.asp

Since October of 2006 the Water Quality Forum partners has completed the draft Stock Creek Watershed Restoration Plan. It is now in its final stages of review and editing. It is anticipated that the final report will be submitted to the Nonpoint Source Program by December, 2007. Other activities that have occurred over this past year that are related and reflected in the restoration plan include Knox County MS4 submitting its proposed Stock Creek TMDL monitoring plan to TDEC and Knox Chapman Utility receiving $425,000 from the HUD CDBG Program to extend its sewer lines in areas within the watershed that were identified as high risk for septic failures.

In regards to watershed education, emphasis over this past year has been on involving youth in educating the community on the health of Stock Creek Watershed and best management practices that residents may implement to help protect their water resources. In the fall and spring semesters at South Doyle High, the Ecology classes conducted comprehensive watershed investigations. In December, 2006, the fall class presented their findings at a Science Symposium (see Photo A) and in the spring, they presented their findings to Stock Creek Watershed Initiative partners (see Photo B). At South Doyle Middle, the students dedicated a year to learning about five residential low impact development (LID) strategies and in May of 2007, they conducted an educational session at the City/County building about these practices to public officials and their staffs (see Photo C). In addition to providing presentations, the students created models, brochures and displays on each of the five LIDs (see Photo D). These included rain gardens, rain barrels, pervious surfaces, grassy swales and green roofs.

Photo A

South Doyle High Fall Ecology Class: Knox Co Science Symposium Presentation

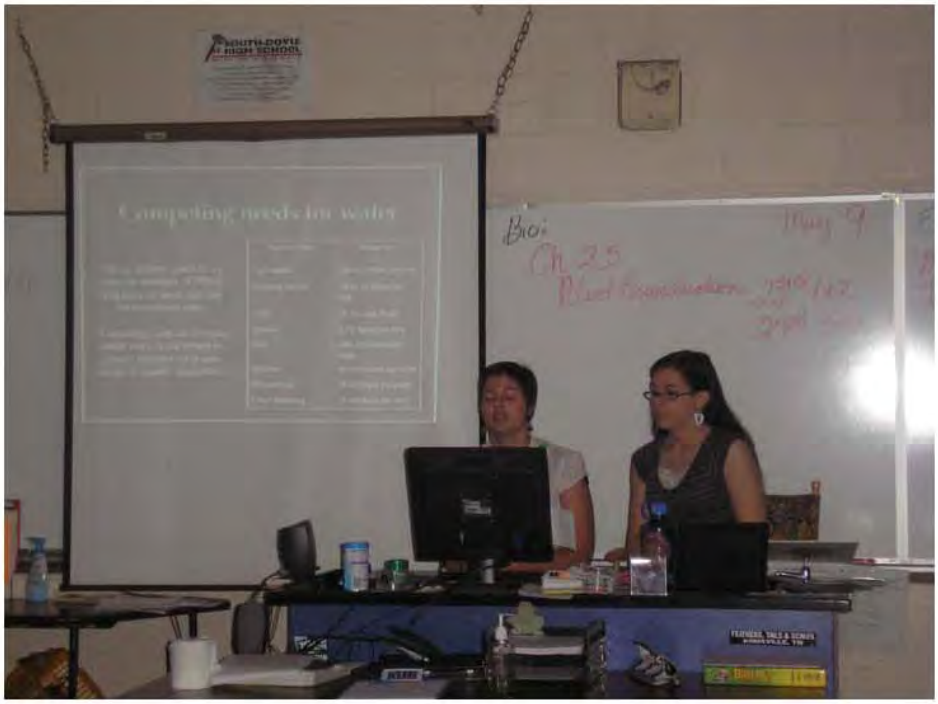


Photo B

South Doyle High Spring Ecology Class: Presentation to SCWI Partners

Photo C
South Doyle Middle LID Project: Presentation to Community Officials & Staff

Photo D
South Doyle Middle LID Project: Example of Display Materials

Appendix A

Tennessee *Success Stories*

Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

Tennessee

Streambank Restoration and Cattle Exclusion Reduce Siltation and Improve Water Quality

Waterbody Improved

Agricultural practices and land development in the Arrington Creek watershed were contributing to silt runoff that was degrading the water quality of the creek. The waterbody was listed as impaired on Tennessee's 2002 303(d) list due to siltation from agriculture and land development. Best management practices (BMPs) implemented in the watershed successfully improved the water quality of Arrington Creek and allowed for its removal from the impaired list in 2004.

Problem

Arrington Creek is located in Williamson County in central Tennessee. It is in the Harpeth River watershed, Ecoregion 71i. A 24.6-mile segment of Arrington Creek was listed as impaired on the state's 2002 303(d) list for siltation. Arrington Creek was only partially supporting criteria for its designated use classification (fish and aquatic life). The state identified agricultural practices and land development as the primary sources of silt entering the waterbody. A siltation and habitat alteration total maximum daily load (TMDL) was previously developed for this watershed and approved by EPA in 2002.

Project Highlights

Eight BMPs were implemented along Paige Branch, a tributary to Arrington Creek, between 1999 and 2003. The installment of exclusion fencing and an alternative watering facility prevented livestock from entering the stream, thereby reducing the trampling of streambanks. Other BMPs implemented include pasture and hay planting along critical areas, reinforcement of heavy use areas, streambank protection, and planting riparian buffers (Figure 1). These management practices helped reduce the amount of silt and runoff entering the waterway.

Results

The BMPs implemented along Paige Branch, a tributary to Arrington Creek, have helped reduce the level of siltation entering the waterbody and allowed it to meet its designated water quality standards such that there were no distinctly visible solids, scum, foam, oily slick, or the formation of slimes, bottom deposits or sludge banks. In addition the Branch was found to be no longer detrimental to fish and aquatic life. This stream was reassessed in 2002 by the Tennessee Department of Environment and Conservation (TDEC). Using EPA's rapid bioassessment protocol III (RBPIII), state biologists calculated a biological reconnaissance (biorecon) score for Arrington Creek, which is used to measure a compliance with the state water quality standard for siltation. Biorecon is one tool used to recognize stream impairment as judged by species richness measures, emphasizing the presence or absence of indicator organisms without regard to relative abundance. The biorecon index is scored on a scale from 1–15. A score less than

5 is regarded as very poor. A score over 10 is considered good. The principal metrics used are the total macroinvertebrate families (or genera), the number of families (or genera) of mayflies, stoneflies, and caddisflies (EPT), and the number of pollution intolerant families (or genera) found in a stream. The biorecon results for Arrington Creek indicated 10 EPT families, 7 intolerant, and 25 total families. The stream received a score of 15 out of 15, indicating that it is now fully supporting fish and aquatic life. The stream got a habitat score of 115, which is similar to the established habitat goal for this region. The stream has improved since last assessed and therefore Arrington Creek was removed from Tennessee's list of impaired waters in 2004.

Partners and Funding

The Williamson County Soil Conservation District and the Harpeth River Watershed Association helped implement the BMPs with $12,500 of section 319 direct and matched funding. An additional $55,627.81 was contributed by the Tennessee Agricultural Resources Conservation Fund and matching funds.

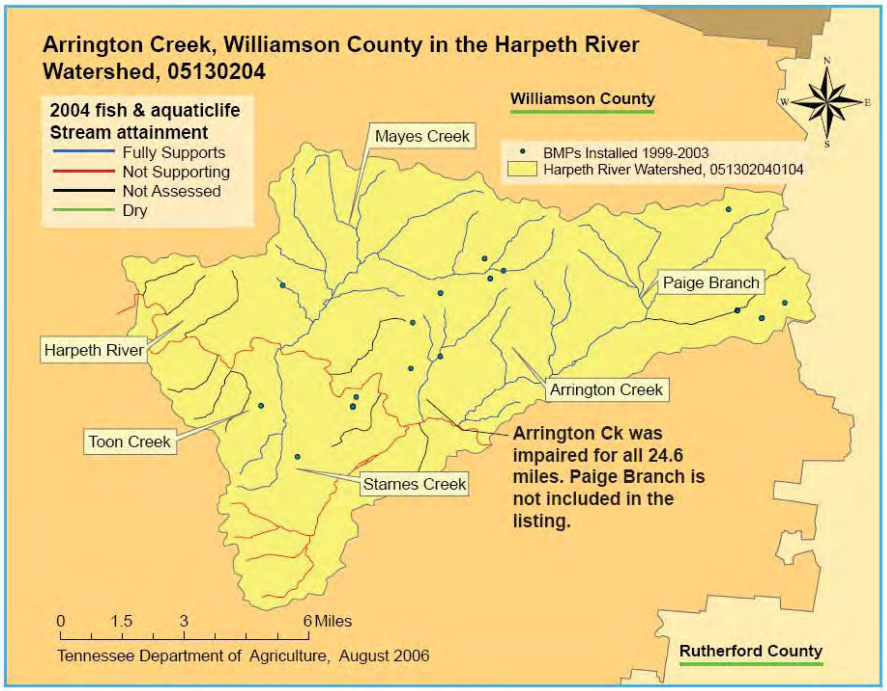


Figure 1. BMPs implemented in the Harpeth River watershed.

U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA 841-F-07-001Q
September 2007

For additional information contact:
Sam Marshall, Tennessee Department of Agriculture
615-837-5306
Sam.Marshall@state.tn.us

Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Tennessee

Livestock Management Improves Dissolved Oxygen in Big Sandy

Waterbody Improved

Polluted runoff from pasture-grazing cattle caused abnormally high pathogen levels and low dissolved oxygen concentrations in Big Sandy River. These problems led to the state placing a 7.3-mile river segment on its 303(d) list for impairments in both 2002 and 2004. Using section 319 funding, farmers installed a number of best management practices (BMPs) on pasturelands adjoining the river's impaired segments, including foundations to support cattle in heavy-use areas, grade stabilization structures, pasture and hay planting, critical area planting, livestock watering pipelines, and alternative watering structures. The BMPs resulted in water quality improvements in the 7.3-mile segment and its removal from the state's 2006 303(d) list for dissolved oxygen impairments.

Problem

The 7.3-mile river segment is in Carroll County where Big Sandy River becomes Maple Creek. The Big Sandy River is in the Kentucky Lake watershed in northwestern Tennessee in Ecoregion 65e, a predominantly forested watershed. Pastures, cropland, and hay fields cover approximately 22 percent of the area. The designated use classifications for Big Sandy River include fish and aquatic life, irrigation, livestock watering and wildlife, and recreation. Another designated use classification of Big Sandy River is as industrial water supply.

The 7.3-mile segment was listed as impaired on the 2004 303(d) list for low in-stream dissolved oxygen (DO) concentrations due to pasture grazing. Monitoring along Big Sandy River from 1999 to 2001 showed that the segment was not meeting criteria to support its most stringent designated use classification—recreation. It showed maximum *E. coli* individual sample values that were in violation of the state-established criteria protective of the recreation designated use classification, a maximum individual sample of 941 cfu/100 mL (Figure 1). In addition, fecal coliform values above the state-established criterion of 1,000 cfu/100 mL were observed at multiple sampling stations.

A TMDL study for pathogen loads in the Kentucky Lake watershed was established by the Tennessee Department of Environment and Conservation and approved by EPA in 2005. The study allocated a 44.8 percent reduction in pathogen loading into the Maple Creek branch of Big Sandy River.

Project Highlights

Using a combination of 319 funding and state funds obtained through the Agricultural Resources Conservation Fund (ARCF), the local Soil and Water Conservation District offices in Carroll and Henderson counties worked with local landowners to promote and install management practices and structures that would both reduce pathogen runoff into Big Sandy River and improve the landowners' operations. The Chickasaw-Shiloh Resource Conservation & Development Program (RC&D) and the Hatchie River Watershed Association provided additional technical assistance and support. The BMPs installed included (1) foundations to support cattle and soil in heavy-use areas, (2) grade stabilization structures to prevent stream bank failure, (3) pasture seeding and riparian zone planting along critical areas, and (4) the installation of pipelines and other alternative

water structures, including wells and ponds, designed to keep livestock out of streams.

The foundations and support for heavy-livestock-use areas (places where cattle gather for watering and feeding) were designed to reduce soil erosion caused by livestock usage. Critical stream bank areas were also protected. These water quality control measures also provide livestock health benefits and improve area aesthetics.

Local agriculture agency partners (from both USDA-RC&D and ARCF) advised landowners on the technical design and specifications of BMPs and provided oversight and expertise during the installation process. Landowners participated voluntarily, providing partial labor and funds for the BMPs. The BMPs were installed in the 2003–2005 period, and they continue to help meet the load reduction allocations in the 2005 TMDL.

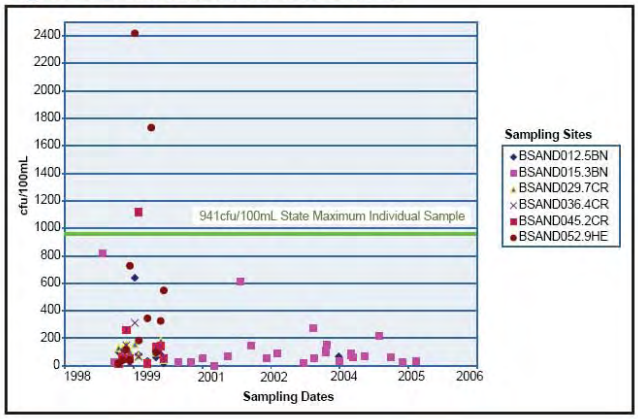
Results

In the most recent Rapid Bioassessment Protocol III sampling of the 7.3-mile segment of Big Sandy River, state biologists found 12 EPT (pollutant-sensitive) genera and 47 total genera of benthic macroinvertebrates. The Tennessee Stream Condition Index (TSCI) was used to compare subregions with a total possible score of 42. The TSCI Index score for the 7.3-mile segment was 40, which is in the "very good" range and much better than the regional goal of 32. In addition, a diurnal (daily) DO study was done in 2002 at mile 36.4. DO levels stayed above 7 mg/L, which is above the minimum standard of 5 mg/L, even during low-flow periods. The DO data, along with the high biological integrity scores, indicated that the stream is meeting water quality standards, and therefore the segment was delisted in the 2006 cycle for DO. However, the segment remains listed for *E. coli*.

Partners and Funding

Big Sandy River has benefited from $461,566 of Clean Water Act section 319 funding. The Tennessee State ARCF also provided $10,016. Key partners in this effort include the Carroll County and Henderson Soil Conservation Districts, Chickasaw-Shiloh RC&D, and the Hatchie River Watershed Association. Agents of these generous partners provided technical expertise and labor. Landowners in the Kentucky Lake watershed contributed in-kind labor hours and some funding.

Figure 1. *E. coli* values from 1998 to 2006.



U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA 841-F-07-001N
August 2007

For additional information contact:
Sam Marshall
Tennessee Department of Agriculture
615-837-5306
Sam.Marshall@state.tn.us

Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Tennessee

Reducing the Impacts of Cattle Grazing Improved Water Quality

Waterbody Improved Polluted runoff from pasture-grazing cattle and erosion of sensitive pastureland degraded the water quality of Cripple Creek. This led to the listing of a 7.7-mile segment of Cripple Creek as impaired in 2002. Several best management practices (BMPs) were implemented, including pasture renovation, grassed waterways, and a livestock watering facility. This resulted in water quality improvements of the 7.7-mile segment of Cripple Creek and its removal from the 2004 list of impaired waters.

Problem

Cripple Creek is located in the East Stones River Watershed in Rutherford County, Ecoregion 71i. The creek was listed as impaired on the 2002 303(d) list for siltation, which is a common pollutant of surface waters. Siltation can cause significant economic impacts such as increased water treatment costs, loss of storage capacity in reservoirs, direct impacts to navigation, and the increased possibility of flooding. The state identified pasture grazing as the major source of impairment. A siltation total maximum daily load (TMDL) was established in 2002 by Tennessee's Department of Environment and Conservation for Cripple Creek.

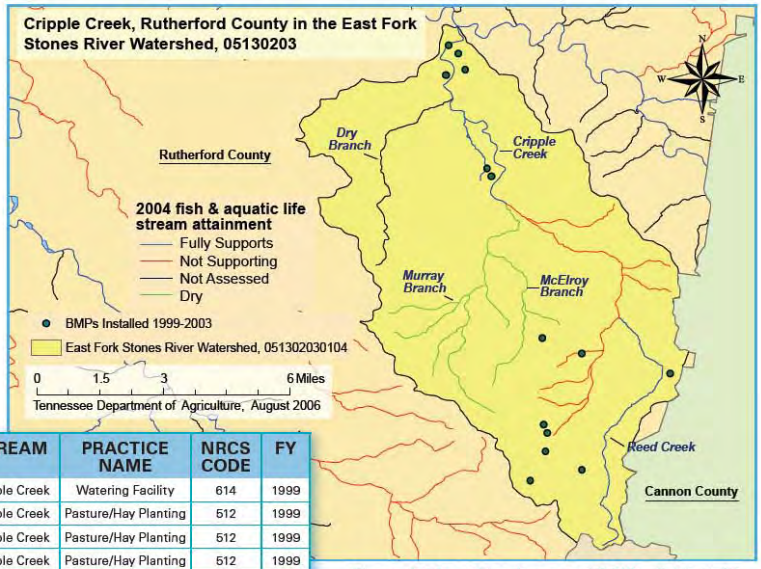
Cripple Creek was listed for not meeting the state water quality standard for siltation in order to fully support its designated beneficial use of fish and aquatic life. The standard states that there shall be no distinctly visible solids, scum, foam, oily slick, or the formation of slimes, bottom deposits or sludge banks of such size or character that may be detrimental to fish and aquatic life.

Project Highlights

Fourteen BMPs were implemented by the Rutherford County Soil Conservation District from 1999 to 2003 in the East Stones Fork River Watershed. Over 157 acres were renovated as a result of replanting pasture lands and the implementation of grassed waterways (Figure 1). Grassed waterways are graded natural structures that improve water quality by conveying runoff without causing flooding or erosion, and help to reduce gully erosion. In addition, an alternative livestock watering facility was implemented to provide accessible water for livestock. The watering facility has several positive effects: 1) it protects and enhances vegetative cover through proper distribution of grazing, 2) it provides erosion control through better grassland management, and 3) it protects Cripple Creek and other water supplies from contamination by providing livestock with alternative access to water.

Results

Using EPA's rapid bioassessment protocol III (RBPIII), state biologists calculated a biological reconnaissance (biorecon) score for Cripple Creek, which is used to measure compliance with the state water quality standard for siltation. Biorecon is one tool used to recognize stream impairment as judged by species richness measures, emphasizing the presence or absence of indicator organisms without regard to relative abundance. The biorecon index is scored on a scale from 1 – 15. A score less than 5 is regarded as very poor. A score over 10 is considered good. The principal metrics used



ID	COUNTY	HUC	STREAM	PRACTICE NAME	NRCS CODE	FY
5746	Rutherford	5130203	Cripple Creek	Watering Facility	614	1999
5760	Rutherford	5130203	Cripple Creek	Pasture/Hay Planting	512	1999
5761	Rutherford	5130203	Cripple Creek	Pasture/Hay Planting	512	1999
5762	Rutherford	5130203	Cripple Creek	Pasture/Hay Planting	512	1999
5764	Rutherford	5130203	Cripple Creek	Pasture/Hay Planting	512	2000
5792	Rutherford	5130203	Cripple Creek	Pasture/Hay Planting	512	2001
5795	Rutherford	5130203	Cripple Creek	Pasture/Hay Planting	512	2001
5800	Rutherford	5130203	Cripple Creek	Grassed Waterway	412	2001
5805	Rutherford	5130203	Cripple Creek	Grassed Waterway	412	2002
5812	Rutherford	5130203	Cripple Creek	Pasture/Hay Planting	512	2002
7599	Rutherford	5130203	Cripple Creek	Pasture/Hay Planting	512	2003
7600	Rutherford	5130203	Cripple Creek	Pasture/Hay Planting	512	2003
5748	Rutherford	5130203	Cripple Creek	Pasture/Hay Planting	512	1999
5825	Rutherford	5130203	Cripple Creek	Grassed Waterway	412	2002

Figure 1. Map of Implemented BMPs. Table (left) is a list of implemented BMPs.

are the total macroinvertebrate families (or genera), the number of families (or genera) of mayflies, stoneflies, and caddisflies (EPT), and the number of pollution intolerant families (or genera) found in a stream. The biorecon results for Cripple Creek indicated 8 EPT families, 3 pollutant intolerant taxa, and 20 total families. Using the scoring system for biorecons, this stream scored a 15. The stream got a habitat score of 146, which is better than the established habitat goal for this ecoregion. Water quality standards were also met at a chemical station located on the creek at mile 0.4, resulting in the delisting of Cripple Creek from the 2004 303(d) list.

Partners and Funding

The Rutherford County Soil Conservation District helped implement the BMPs with section 319 funding. $7,143 of section 319 funding was matched with $3,146.86 in local contributions. The Tennessee Agricultural Resources Conservation Fund (ARCF) provided an additional $9,341.02, $3,699.22 of which was locally matched.

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Office of Water
Washington, DC

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For additional information contact:
Sam Marshall, Tennessee Department of Agriculture
615-837-5306
Sam.Marshall@state.tn.us

Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Tennessee

Bedford County Improves Water Quality Through Waste Management Systems

Waterbody Improved Polluted runoff from pasture grazing caused nutrients and sediment to enter into Fall Creek, which led to the listing of a 11.4-mile segment of Fall Creek as impaired in 2002 and 2004. Using section 319 funding, the Bedford County Soil Conservation District installed two major Waste Management Systems on tributaries to Fall Creek in 1999. This resulted in water quality improvements of the 11.4-mile segment of Fall Creek and its removal from the 2006 303(d) list of impaired waters.

Problem

Fall Creek is located in the Duck River watershed in Bedford County. This specific segment is impaired from Duck River to the headwaters in EcoRegion 71l. Fall Creek was listed as impaired on the 2002 and 2004 303(d) lists due to nutrients, loss of biological integrity, and habitat alterations from pasture grazing. Fall Creek has many designated use classifications including fish and aquatic life, recreation, livestock watering and wildlife, and irrigation. It was listed as impaired for not fully supporting the fish and aquatic life and recreation beneficial uses due to siltation altering the habitat and excess nutrients resulting in low dissolved oxygen.

Two total maximum daily loads (TMDLs) were established for Fall Creek in 2006 by the Tennessee Department of Environmental Conservation for low dissolved oxygen caused by excess nutrients and habitat alteration caused by siltation.

Project Highlights

The local Soil Conservation District offices in Bedford County administered the Clean Water Act section 319 funding to allocate funding assistance. Using a combination of 319 funding as well as state funds through the Agricultural Resources Conservation Fund (ARCF) they installed Waste Management Systems on tributaries to Fall Creek in 1999. These systems included two litter storage units for chickens with the capacity to store and compost 199 acres on Parch Corn Creek, which runs into Fall Creek (Figure 1).

The installation of these poultry composters and animal waste systems minimized the potential for contamination of streams. The waste facilities also reduce the pollution potential of organic agricultural wastes to surface and ground water.

Results

The Tennessee Macroinvertebrate Community Assessment is used to calculate the Tennessee Stream Condition Index (TSCI), which is a measure of biological health of an aquatic system. This index is used by the state in determining a waterbody's compliance to state water quality standards for the beneficial

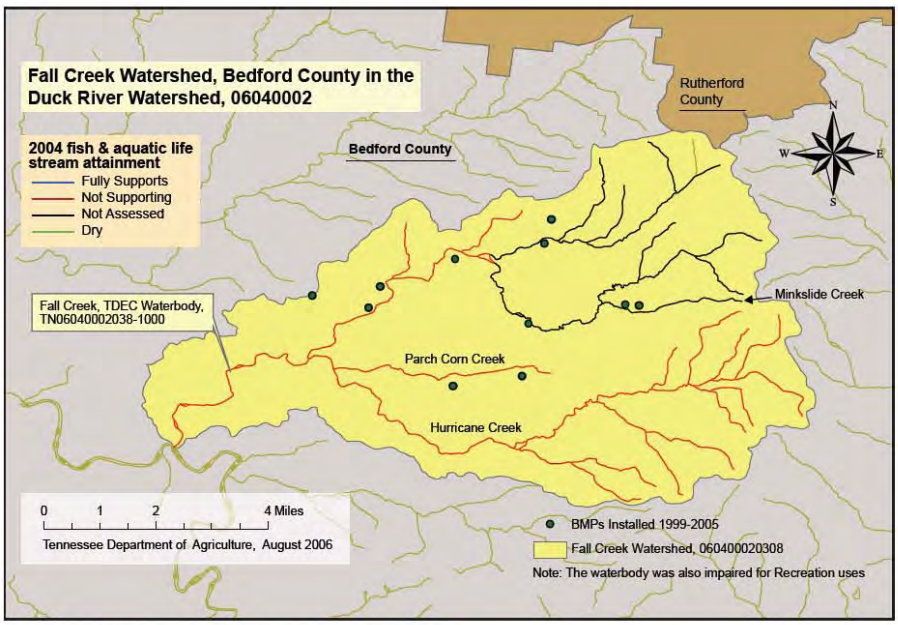

Figure 1. Locations of BMPs installed from 1999–2005

use of fish and aquatic life. The TSCI was used to compare subregions and determine a score, for a total possible score of 42.

Chemical and biological stations were established on this stream in 2004. While the stream was found to still be impacted by pathogens and will remain listed on that basis, Rapid Bioassessment Protocol (RBPIII) sampling at two different locations documented TSCI scores of 36 and 32, which met Tennessee's biological integrity goals.

Therefore Fall Creek has been removed from the 303(d) list in 2006 for nutrients, biological loss due to siltation, and habitat alteration.

Partners and Funding

Fall Creek has benefited from a total of $13,861.47 provided through cost-share from section 319 grant pool projects. In addition, $94,747.00 was provided by a Tennessee State ARCF grant and local match.

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Office of Water
Washington, DC

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For additional information contact:
Sam Marshall, Tennessee Department of Agriculture
615-837-5306
Sam.Marshall@state.tn.us

Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Tennessee

Livestock Management Restores Waterbody

Waterbody Improved

Polluted runoff from pasture-grazing cattle caused abnormal *Escherichia coli* counts in Hinds Creek, which led to 8.9 miles of the stream being listed on the state's 303(d) list in 2002 and 2004.

Using section 319 funding, farmers installed a number of BMPs on pastureland adjoining the creek. The practices included pasture and hay planting, fencing, streambank protection, and separate watering structures. The farmers' action allowed the Hinds Creek segment to be removed from the 2006 303(d) list.

Problem

Hinds Creek is in the Lower Clinch watershed in eastern Tennessee, a primarily rural watershed with approximately 75 percent forest and 15 percent agriculture. Hinds Creek was listed as impaired on the state's 2002 and 2004 303(d) lists due to high *E. coli* colony counts and in-stream concentrations. Polluted runoff carrying fecal matter and pathogens from pasture-grazing livestock was the source of this pollution.

Hinds Creek has multiple designated use classifications, including fish and aquatic life, livestock watering and wildlife, irrigation, and recreation. Monitoring along Hinds Creek between 1999 and 2004 found that the creek was fully supporting all designated uses except recreation. Analysis results for individual samples collected by the state were in violation of the state-established water quality criteria for *E. coli*. The Tennessee water quality standards state that the concentration of the *E. coli* group in any individual sample must not exceed either (a) 487 cfu/100 mL for lakes, reservoirs, State Scenic Rivers, or Tier II or III waterbodies or (b) 941 cfu/100 mL for all other waterbodies. Hinds Creek is in the latter category.

A TMDL for pathogens in the Lower Clinch watershed, established in 2005 by the Tennessee Department of Environment and Conservation, specified a 49.5 percent reduction in pathogen loading into Hinds Creek.

Before the project, high flows during storm events caused increased erosion.

Project Highlights

Local Soil and Water Conservation District offices in Anderson and Union counties administered the CWA section 319 funding to allocate funding assistance to local landowners. Using a combination of 319 funding and state funds from the Agricultural Resources Conservation Fund (ARCF), they worked with local landowners to promote and install management practices and structures that would reduce pathogen runoff into Hinds Creek and improve landowners' operations.

Installed fencing with stream buffer on left.

The BMPs installed included (1) pasture seeding and riparian zone planting along Hinds Creek and tributaries; (2) stabilization of heavy-use areas using gravel and geotextile fabric; (3) installation of alternative watering facilities, such as tanks, troughs, and ponds fed by pipelines to keep livestock out of streams; and (4) alternative access roads to help combat further erosion.

Pasture and riparian critical areas were seeded with a selection of grasses that were acceptable to livestock and beneficial for proper soil drainage in the area. Problem weed and thistle species were replaced with balanced and native foliage to improve water quality, conserve soil, and increase carbon sequestration.

Local Soil and Water Conservation District agents advised landowners on the technical design and specifications of the BMPs, and they provided oversight and expertise during the installation process. Landowners participated voluntarily, partially providing labor and funds for the BMPs. The BMPs were installed beginning in 2000, and continue to be installed to help continue to meet the load reduction allocations in the 2005 TMDL.

The Hinds Creek Watershed Partnership, a group composed of federal, state, and local partners, is focused on improving water quality and community awareness of water quality issues in Hinds Creek. The Partnership is part of a cooperative water quality monitoring project with the Tennessee Department of Environment and Conservation and the Tennessee Valley Authority that aims to produce comprehensive watershed assessments. Gathering information regarding the health of the watershed will help in prioritizing areas of work.

Results

Recent monitoring in Hinds Creek showed *E.coli* values below the individual sample standard of 941 cfu/mL. Hinds Creek is no longer considered impaired for any of the four designated uses, including recreation. Therefore, the 8.9 total miles previously listed as impaired were not included on the 2006 303(d) list.

Partners and Funding

Since 2001 Hinds Creek has benefited from $39,246.41 of Clean Water Act section 319 funding (including additional matching funds, a total of $57,695.17 was spent). In addition, $30,840.35 was provided by the Tennessee ARCF. Key partners in this effort include the Anderson County and Union County Soil Conservation Districts, whose agents provided technical expertise and labor hours. Landowners in the Lower Clinch watershed contributed in-kind labor hours and some funding.

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Office of Water
Washington, DC

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For additional information contact:

Sam Marshall
Tennessee Department of Agriculture
615-837-5306
Sam.Marshall@state.tn.us

Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Tennessee

Revegetation and Streambank Restoration Reduce Siltation and Improve Water Quality

Waterbody Improved

Polluted runoff from non-irrigated crop production resulted in excess sediment in Lick Creek. This resulted in a loss of biological integrity and physical substrate habitat alterations due to siltation, which led to the listing of a 20-mile segment of Lick Creek as impaired in 2002 and 2004. Using section 319 funding, McNairy County Soil Conservation District planted pasture and hay to revegetate the pasture and protect the streambank. These efforts resulted in the removal of the impaired 20-mile segment of Lick Creek from the 2006 303(d) list of impaired waters.

Problem

This 20-mile segment of Lick Creek extends from Snake Creek to the headwaters in the Snake Creek Watershed, McNairy County in Ecoregion 65e. Lick Creek was listed as impaired due to siltation and habitat alteration, resulting in a loss of biological integrity. Polluted runoff carrying sediment from non-irrigated crop production was the source of this pollution and prevented Lick Creek from meeting state water quality standards to fully support its designated beneficial use for fish and aquatic life. The standard states that there shall be no distinctly visible solids, scum, foam, oily slick, or the formation of slimes, bottom deposits or sludge banks of such size or character that may be detrimental to fish and aquatic life.

Project Highlights

The local Soil and Water Conservation District office in McNairy County administered the funding for this project. Using a combination of section 319 matched funding and state funds through the Agricultural Resources Conservation Fund (ARCF), the Conservation District offices worked with local landowners to plant pasture and hay to act as a covercrop and reduce erosion of non-irrigated croplands, as well as provide streambank protection to reduce siltation and improve the habitat of Lick Creek (Figure 1).

Results

Lick Creek was reassessed in 2004 using the biological reconnaissance (biorecon) survey, which is used to measure water quality compliance for the beneficial use of fish and aquatic life. Biorecon is one tool used to recognize stream impairment as judged by species richness measures, emphasizing the presence or absence of indicator organisms without regard to relative abundance. The biorecon index is scored on a scale from 1 – 15. A score less than 5 is regarded as very poor. A score over 10 is considered good. The principal metrics used are the total macroinvertebrate families (or genera), the number of families (or genera) of mayflies, stoneflies, and caddisflies (EPT), and the number of pollution intolerant families (or genera) found in a stream. The biorecon results for Lick Creek indicated 4 EPT genera, 2 pollutant intolerant genera, and 15 total genera.

The resulting score of 11 for this subecoregion (65e) is within the "non-impaired" range. In addition, Lick Creek met the narrative criteria for turbidity and total suspended solids of no observed presence of solids, floating materials and deposits of such a size or character that may be detrimental to fish and aquatic life. Therefore, 20 total previously-impaired miles were delisted from the 2006 303(d) list.

Partners and Funding

Since 2004, Lick Creek has benefited from $7,805.97 provided through cost-share from section 319 Grant Pool Projects. In addition, $3,121.71 was provided by the Tennessee State ARCF. Additional matching funds (state and local) amounted to a total of $10,237.03. Another key partner in this effort was the Chickasaw-Shiloh Resource Conservation and Development Council.

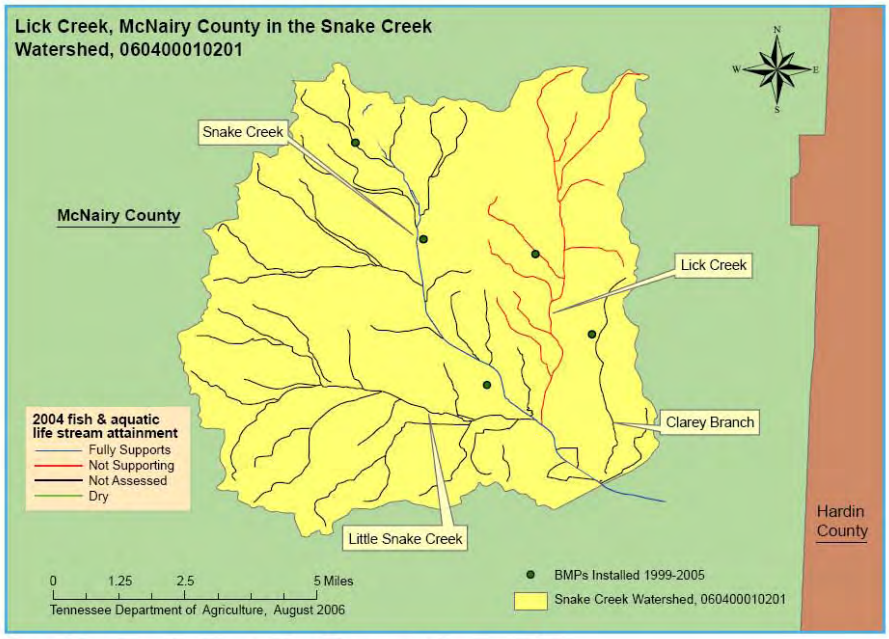

Figure 1. Location of Implemented Best Management Practices (BMPs)

U.S. Environmental Protection Agency
Office of Water
Washington, DC

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For additional information contact:
Sam Marshall, Tennessee Department of Agriculture
615-837-5306
Sam.Marshall@state.tn.us

Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

Tennessee

Agricultural BMPs Reduce the Impact of Cattle Grazing and Improve Quality of Creek's Habitat

Waterbody Improved

A portion of Lick Creek located in Marshall and Rutherford Counties was listed as impaired due to *Escherichia coli (E. coli)* and habitat alterations on the 2004 303(d) list. Using section 319 and state funding, the Marshall County Soil Conservation District installed Heavy Use Area (HUA) best management practices (BMPs), including exclusion fencing, animal waste lagoons, and planted hay and pasture grasses along Lick Creek. These nonpoint source pollution control efforts allowed this 8.8-mile segment of Lick Creek to be removed from the 2006 303(d) list for habitat alterations.

Problem

Lick Creek is located within the Duck River Watershed in Marshall and Rutherford Counties, Ecoregion 71i. The source of the pollutants was identified as livestock grazing in pasturelands where cattle had direct access to the stream, which resulted in the degradation of habitat through the trampling of streambanks and the input of pathogens.

Lick Creek was listed in 2004 for not meeting water quality standards for its designated beneficial uses due to elevated *E. coli* values and habitat alterations as a result of unrestricted cattle access to the creek. Lick Creek Marshall has multiple designated use classifications, including fish and aquatic life, livestock watering and wildlife, irrigation, and recreation. Lick Creek Marshall was listed for not meeting standards to fully support two of its four designated beneficial uses: fish and aquatic life, and recreation.

Tennessee's water quality standards for recreation state that the concentration of the *E. coli* group in any individual sample shall not exceed either (a) 487 cfu/100ml for lakes, reservoirs, State Scenic Rivers, or Tier II or III waterbodies or (b) 941 cfu/100ml for all other waterbodies. Lick Creek Marshall falls into the latter category.

E. coli and siltation total maximum daily loads (TMDLs) were established in 2006 by the Tennessee Department of the Environment and Conservation (TDEC) for Lick Creek in Marshall County.

Project Highlights

Funding from the Agricultural Resources Conservation Fund (ARCF) was used to plant 25 acres of hay and pasture grasses along this segment of Lick Creek and its tributary Plum Branch, to filter pollutants, reduce erosion, and stabilize the stream banks (Figure 1). In addition, exclusion fencing and an animal waste lagoon were installed along the stream to reduce the direct input of pathogens such as *E.coli*.

Results

The Tennessee Macroinvertebrate Community Assessment is used to calculate the Tennessee Stream Condition Index (TSCI), which is a measure of biological health of an aquatic system. The principal metrics used are the total macroinvertebrate families (or genera), the number of families (or genera) of mayflies, stoneflies, and caddisflies (EPT), and the number of pollution intolerant families (or genera) found in a stream. This index is used by the state to determine a waterbody's compliance to state water quality standards for the beneficial use of fish and aquatic life. The TSCI was used to compare subregions and determine a score, for a total possible score of 42. Using EPA's rapid biological protocol III sampling at station 1.8 (Mt. Vernon Road), state biologists found six EPT species and a total diversity of 23 different types of macro-invertebrates. The TSCI score for the station was 36, which is greater than the regional goal of 32 and within the "very good" range. Since biological integrity appears to be no longer impaired, the stream was delisted for habitat alteration and removed from the 2006 303(d) list. However, this segment of Lick Creek remains on the list for *E.coli*.

Partners and Funding

Lick Creek Marshall has benefited from $536.40 provided through cost-share from section 319 grant pool projects. In addition, $1608.60 was provided from the State's ARCF.

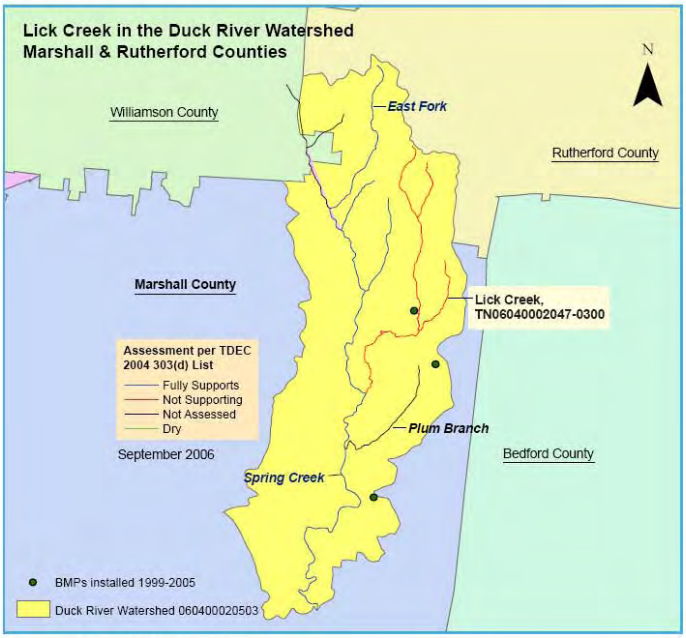

Figure 1. Map of BMPs installed.

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For additional information contact:
Sam Marshall, Tennessee Department of Agriculture
615-837-5306
Sam.Marshall@state.tn.us

Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Tennessee

Heavy Use Area BMPs Reduce Erosion and Improve Water Quality

Waterbody Improved Polluted runoff from pasture grazing livestock and the removal of riparian vegetation caused siltation and habitat alterations in Rock Springs Branch. This led to the listing of an 8.1-mile segment of Rock Springs Branch as impaired in 2002. Using section 319 funding, Putnam, Smith, and DeKalb County Soil Conservation Districts installed heavy use area (HUA) best management practices (BMPs) on Bates Branch, a tributary to Rock Springs Branch. Fifteen acres of HUA were implemented to help stabilize an area that cattle trod through, helping to improve water quality and prevent soil erosion. This resulted in the removal of the Rock Springs Branch segment from the 2004 303(d) list of impaired waters.

Problem

Rock Springs Branch is located in Putnam County within the Caney Fork River Watershed, and consists primarily of rural/urban land uses with approximately 75% forest and 21% agriculture. The Branch was listed as impaired on the state's 2002 303(d) list due to siltation and other habitat alterations. Polluted runoff carrying sediment from grazing fields was the source of this pollution, which impaired the Branch's ability to meet Tennessee's water quality standards to fully support its designated use classifications for fish and aquatic life. The standard states that there shall be no distinctly visible solids, scum, foam, oily slick, or the formation of slimes, bottom deposits, or sludge banks of such size or character that may be detrimental to fish and aquatic life, and the instream habitat within each subecoregion shall be generally similar to that found at reference streams.

A siltation total maximum daily load (TMDL) was established for the Rock Springs Branch in 2005 by the Tennessee Department of Environment and Conservation.

Project Highlights

Local Soil and Water Conservation District offices in Putman, Smith, and De Kalb counties allocated funding assistance to farmers of pasture grazing lands through a grant from the Tennessee State Agricultural Resources Conservation Fund (ARCF). Using a combination of matched 319 funding as well as state funds, they worked with local landowners to promote and install management practices and structures that would both reduce runoff into Rock Springs Branch and improve their operations.

Heavy use area BMPs were installed on two different farms along both Rock Springs and Bates Branch to reduce soil erosion (Figure 1).

Results

Rock Springs Branch was found to have greatly improved water quality due to the installed BMPs. Using EPA's rapid bioassessment protocol III (RBPIII), state biologists calculated a biological reconnaissance score (biorecon) for the Branch, which is used as a measure of compliance with water quality standards for the beneficial use of fish and aquatic life. Biorecon is one tool used to recognize stream impairment as judged by species richness measures, emphasizing the presence or absence of indicator organisms without regard to relative abundance. The biorecon index is scored on a scale from 1 to 15.

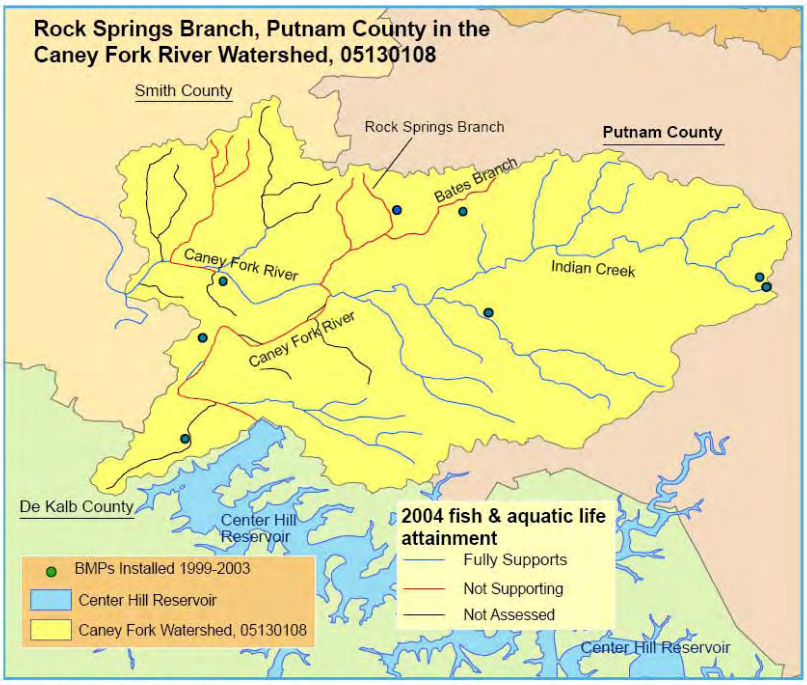

Figure 1. Location of Implemented BMPs

A score of less than 5 is regarded as very poor. A score of more than 10 is considered good. The principal metrics used are the total macroinvertebrate families (or genera), the number of families (or genera) of mayflies, stoneflies, and caddisflies (EPT), and the number of pollution intolerant families (or genera) found in a stream. The biorecon score for Rock Springs Branch indicated 12 EPT families, six pollutant intolerant species, and a total of 29 macroinvertebrate families. Using the Division scoring system for biorecons, this stream scored a 15. The stream got a habitat score of 137, which is better than the established habitat goal for this region. These results indicated the improved water quality and ability to fully support fish and aquatic life. Therefore, the 8.1-mile segment of Rock Spring Branch was delisted from the 2004 303(d) list of impaired waters.

Partners and Funding

Since 2002, Rock Springs Branch has benefited from $57,378.00 provided through cost-share from section 319 grant pool projects. In addition, the State ARCF provided $36,986.72. Key partners in this effort include the Putnam, Smith, and De Kalb County Soil Conservation Districts.

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Office of Water
Washington, DC

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For additional information contact:
Sam Marshall, Tennessee Department of Agriculture
615-837-5306
Sam.Marshall@state.tn.us

Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Tennessee

Pasture and Hay Planting Improve Wades Branch Water Quality

Waterbody Improved Runoff from pasture grazing cattle resulted in excess sediment entering and degrading a 7.2-mile segment of Wades Branch. This led to the listing of the segment as impaired in 1998 and subsequent years for siltation and habitat alteration. In 2002 and 2003, best management practices (BMPs), including pasture and hay planting, reduced sediment loads and resulted in the removal of Wades Branch from the 2004 303(d) list of impaired waters.

Problem

Wades Branch is located in the Stones River Watershed in Rutherford County, Ecoregion 71i. The 7.2-mile impaired segment, which runs from Stones River to the Dunaway Chapel Road Fork, was added to Tennessee's 2002 303(d) list of impaired waters for not meeting state water quality standards for siltation and habitat alteration to fully support its designated use classification of fish and aquatic life. The standard states that there shall be no distinctly visible solids, scum, foam, oily slick, or the formation of slimes, bottom deposits or sludge banks of such size or character that may be detrimental to fish and aquatic life, and the instream habitat within each subecoregion shall be generally similar to that found at reference streams. Excess siltation alters the in-stream conditions by covering substrate with a layer of sediment that reduces habitat for benthic (bottom-dwelling) organisms that provide food for fish.

A siltation and habitat alteration total maximum daily load (TMDL) was completed for Wades Branch, by Tennessee's Department of Environment and Conservation, and approved by EPA in 2002.

Project Highlights

In 2000, 24 acres were renovated by replanting hay and pasture grasses within the watershed (Figure 1). In 2003, 21 acres of pasture lands along Wades Branch were renovated. The re-introduction of native plant species and more adaptable species not only helps to eliminate soil erosion and improve water quality, it also improves grazing livestock nutrition.

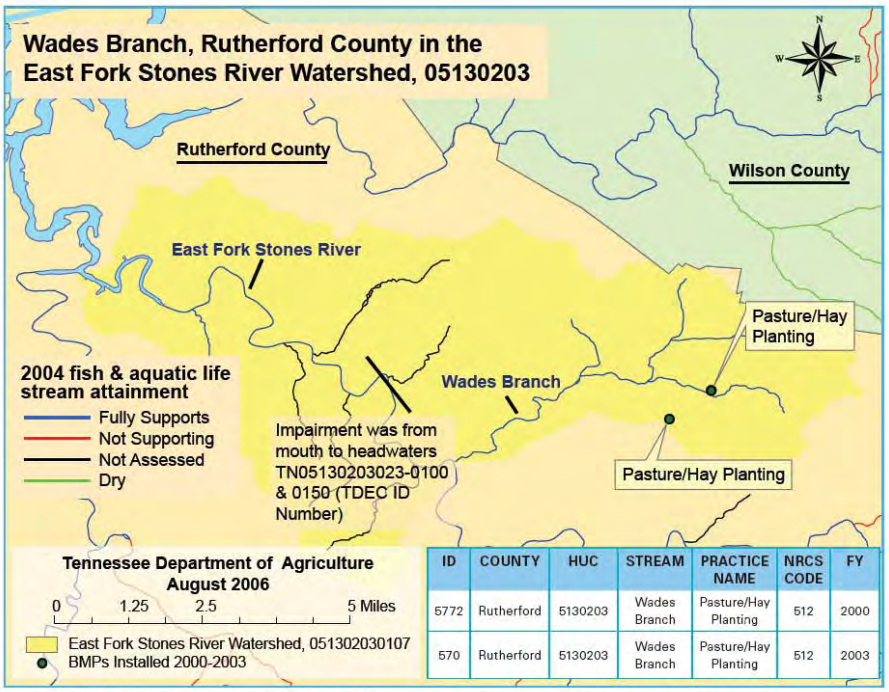
Results

Using EPA's rapid bioassessment protocol III (RBPIII), state biologists calculated a biological reconnaissance score (biorecon) for the Branch, which is used as a measure of compliance with water quality standards for the beneficial use of fish and aquatic life support. Biorecon is one tool used to recognize stream impairment as judged by species richness measures, emphasizing the presence or absence of indicator organisms without regard to relative abundance. The biorecon index is scored on a scale from 1 to 15. A score of less than 5 is regarded as very poor. A score of more than 10 is considered good. The principal metrics used are the total macroinvertebrate families (or genera), the number of families (or genera) of mayflies, stoneflies, and caddisflies (EPT), and the number of pollution intolerant families (or genera) found in a stream. The biorecon results for Wades Branch indicated 11 EPT families (pollution sensitive species), 8 pollutant intolerant species, and 26 total

families. Using this scoring system for biorecons, this stream segment scored a 15. The stream segment got a habitat score of 125, which is better than the established habitat goal for this region. The stream segment has improved greatly since last assessed and consequently resulted in the removal of this 7.2-mile segment of Wades Branch from the 2004 303(d) list of impaired waters.

Partners and Funding

The Rutherford County Soil Conservation District implemented the BMPs using $1,807.41 provided through cost-share from section 319 grant pool projects. In addition, the Tennessee Agricultural Resources Conservation Fund (ARCF) provided $2,000 in funding.



ID	COUNTY	HUC	STREAM	PRACTICE NAME	NRCS CODE	FY
5772	Rutherford	5130203	Wades Branch	Pasture/Hay Planting	512	2000
570	Rutherford	5130203	Wades Branch	Pasture/Hay Planting	512	2003

Figure 1. BMPs implemented in the East Fork Stones River Watershed (051302030107) 2000–2003

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For additional information contact:
Sam Marshall, Tennessee Department of Agriculture
615-837-5306
Sam.Marshall@state.tn.us

Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Tennessee

Diverse Best Management Practices Control Urban and Agricultural Runoff

Waterbody Improved High nutrient concentrations from agricultural runoff, loss of biological integrity as a result of siltation, and habitat loss from streamside alteration caused Tennessee to put a 15-mile segment of West Sandy Creek on its 303(d) list of impaired waters in 2002 and 2004. Sources included agriculture use, bank and shoreline modification, and runoff from urbanized areas. To help address the problems, the Henry County Soil Conservation District (District) implemented 10 best management practices (BMPs), including grade-stabilization structures, water/sediment control basins, terrace construction, and hay and pasture plantings. The BMPs improved the water quality in the 15-mile segment, which was removed from the 2006 303(d) list of impaired waters.

Problem

West Sandy Creek is in the Kentucky Lake watershed in Henry County (Ecoregion 65E). The 15-mile impaired segment of West Sandy Creek extends from the West Sandy embayment in Kentucky Lake to the creek's headwaters. Tennessee added the creek to its 2002 and 2004 303(d) lists of impaired waters because of siltation, high nutrient concentrations, loss of habitat, and poor biological integrity. The state identified the sources of siltation as runoff from agricultural land and urban areas. Modification of the creek's shoreline led to its listing for habitat loss. This segment of West Sandy Creek was not meeting water quality criteria to fully support its designated use classification for fish and aquatic life. The state standards require that there be no distinctly visible solids, scum, foam, oily slick, or the formation of slimes, bottom deposits, or sludge banks of such size or character that could be detrimental to fish and aquatic life.

Project Highlights

The District implemented 10 BMPs in the Kentucky Lake watershed between 1999 and 2005. Pasture and hay planting, terrace construction, and installing water/sediment control basins helped to prevent excess silt from entering the creek. The terraces stabilized steep slopes along the creek and reduced runoff and soil erosion. Water/sediment control basins reduced stream bank scouring and gully erosion, trapped sediment, and reduced runoff, thereby improving water quality.

The District also created grade-stabilization structures throughout the watershed. These structures controlled the grade of the creek and helped prevent water from cutting into the side of natural or artificial channels. The practice was used in areas where the concentration and flow of water could potentially have caused gully erosion.

Three grade-stabilization structures and one terrace were installed in the drainage area of West Sandy Creek (Figure 1). The District also installed two water/sediment control basins and one grade-stabilization structure in the Spring Creek drainage area. Clifty Creek benefited from the installation of one water/sediment control basin. One grade-stabilization

structure was installed on Chapel Branch, in the Kentucky Lake watershed.

Results

The BMPs implemented in the West Sandy Creek watershed reduced the level of nutrients and silt in the water and helped to prevent streamside erosion. Using the U.S. Environmental Protections Agency's (EPA's) rapid bioassessment protocol III (RBPIII), state biologists calculated a biological reconnaissance score (biorecon) for the West Sandy Creek, which is used to measure compliance with the state water quality standard for siltation. Biorecon is one tool used to recognize stream impairment as judged by species richness measures, emphasizing the presence or absence of indicator organisms without regard to relative abundance. The biorecon index is scored on a scale from 1 to 15. A score of less than 5 is regarded as *very poor*. A score of more than 10 is considered *good*. The principal metrics used are the total macroinvertebrate families, the number of families of mayflies, stoneflies, and caddisflies (collectively referred to as EPT, which is short for the order names Ephemeroptera, Plecoptera, and Trichoptera), and the number of pollution intolerant families found in a stream.

In 2004 biological sampling on West Sandy Creek, state biologists found 19 total families, 5 EPT families, and 1 pollutant-intolerant family. The biorecon score for the station was 13, which is in the *good* range. The data indicate that the stream is meeting water quality standards. Therefore, Tennessee removed this 15-mile segment of West Sandy Creek from its 2006 303(d) list of impaired waters.

Partners and Funding

The Henry County Soil Conservation District implemented the BMPs with $24,817 provided by the Tennessee state Agricultural Resources Conservation Fund through cost-share from Clean Water Act section 319 grant pool projects. In addition, local matching funds contributed $13,170.

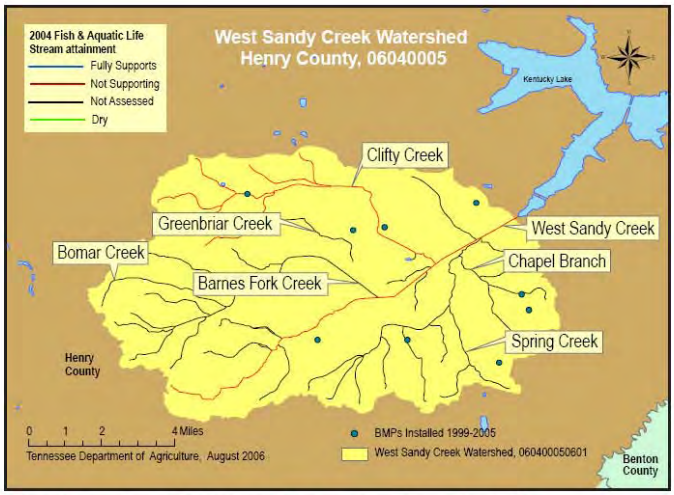

Figure 1. Location of BMPs installed along West Sandy Creek, TN.

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For additional information contact:
Sam Marshall, Tennessee Department of Agriculture
615-837-5306
Sam.Marshall@state.tn.us